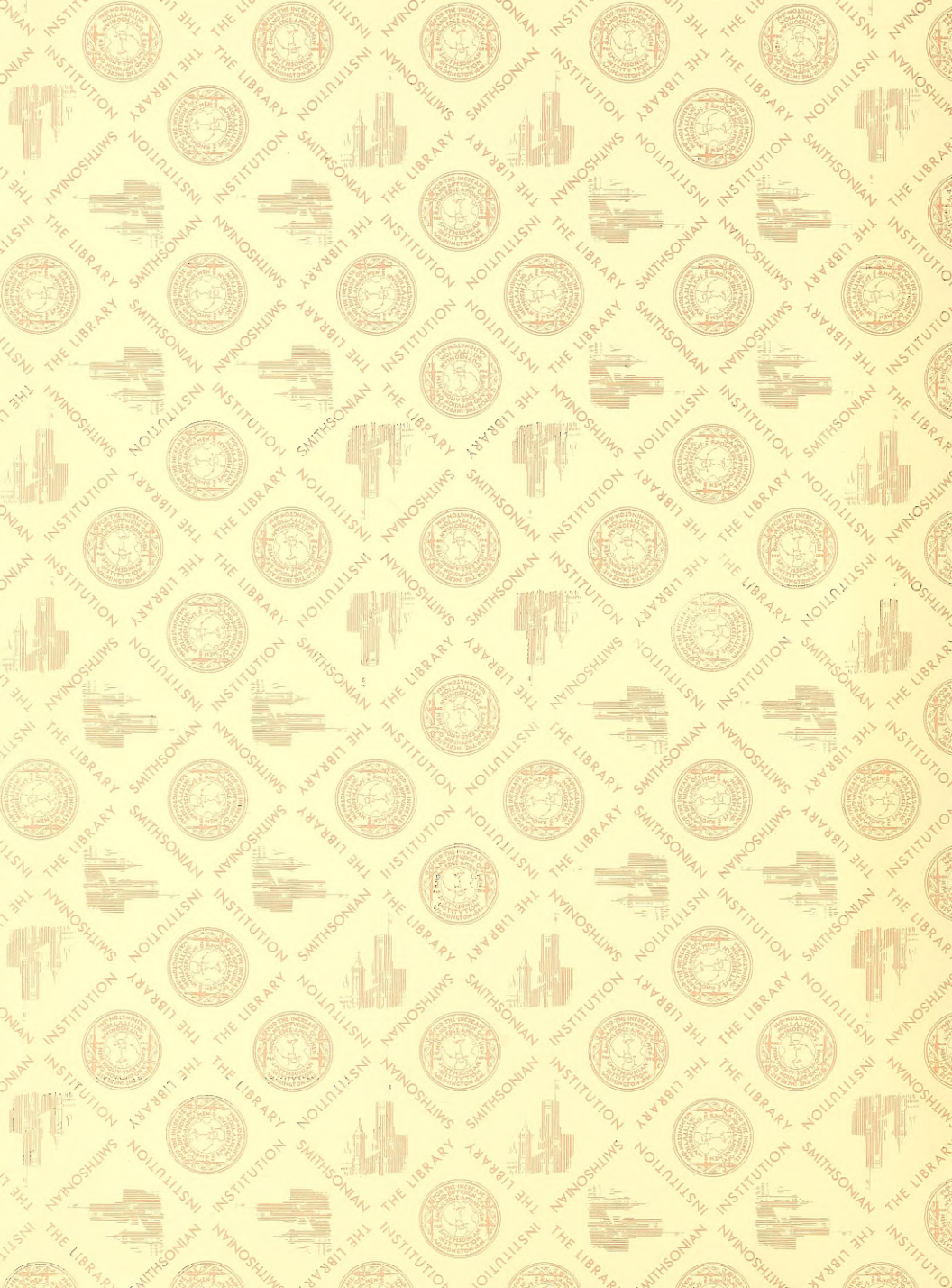
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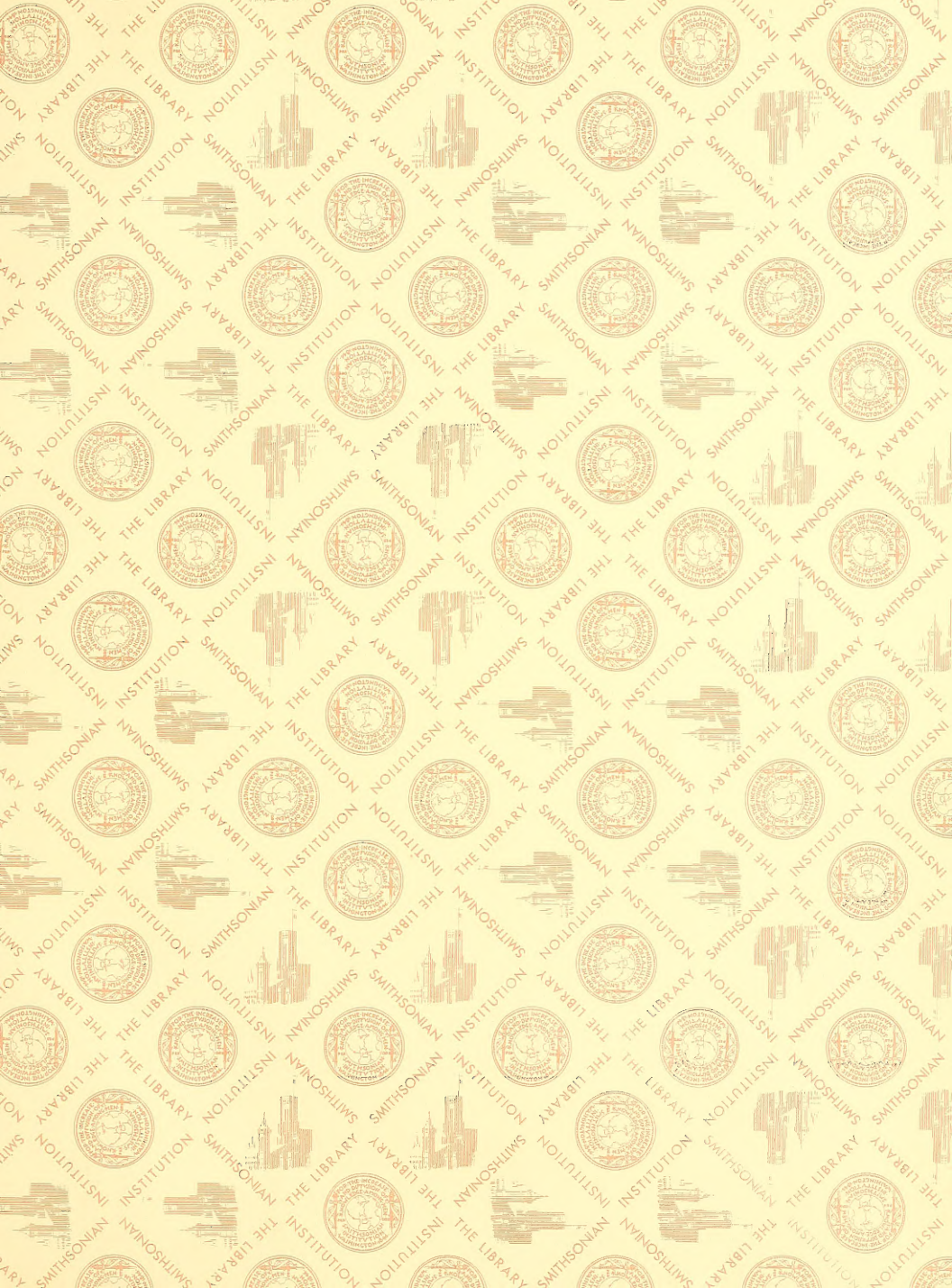
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A MONOGRAPH

OF

THE ENTOMOSTRACA

OF THE

CRETACEOUS FORMATION OF ENGLAND.

BY

T. RUPERT JONES.

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THE ENTOMOSTRACA

OF

THE CRETACEOUS FORMATION.

Of the numerous microscopic organisms afforded by the disintegration of the Oolitic, Cretaceous, and Tertiary strata, whether calcareous, argillaceous, or sandy, the Polythalamia and the Entomostraca are by far the most abundant. The latter attract observation by their larger relative size, but have not been hitherto very extensively described.

Our present observations are confined to the Entomostraca of the Cretaceous Formation, comprising the Chalk, Chalk-marl, Gault, and Greensand. The strata that have afforded the species herein described are the greensand beds of Blackdown (siliceous), of Warminster (calcareous), and of Farringdon (arenaceous); the Speeton Clay; the Gault of Folkstone and of Leacon Hill, near Charing; the Grey Chalk and Chalk-marl of Dover; the Cretaceous Detritus of Charing; the Red Chalk of Flamborough; and the common White Chalk of the south-east of England. In the above-mentioned strata these little fossils lie about irregularly in all directions, and are not found in layers such as are often formed by the Entomostraca of the Wealden and Tertiary beds; many are broken or eroded, and some bear evidence of having been crushed whilst in a recent state. The animal matter of the carapace is well preserved in the Gault specimens, and more or less so in others; individuals bearing a trace of transparency and of original colouring occur, but are extremely rare, in the Chalk; whilst in the Gault a large proportion remains transparent.[1] The specimens generally occur as separate valves, but perfect carapaces are not unfrequently found, the latter condition being dependent upon the strength of the hinge attachment, which varies considerably in different species.

The Gault and the Soft Chalk are very rich in Entomostraca; but the most abundant supply of these and other Cretaceous animalculites is obtained from the "Chalk-

[1] MM. Cornuel and Bosquet refer to the fact of the colouring matter being retained by some of the Entomostraca in the French Neocomian beds and the Maestricht limestone.

detritus" of Charing, Kent. For specimens of the Detritus, and for a fine suite of its Microzoa, I am indebted to Mr. Harris, of Charing.[1] To Mr. Morris I am indebted for his kind assistance in working out the history and characters of the Entomostraca, and for specimens of the foreign Cretaceous rocks, so necessary for comparison. I have also to acknowledge the courtesy and kindness shown me by Dr. Baird, who has favoured me with much valuable information on the subject of the recent Entomostraca.

The earliest notice of the occurrence of Entomostraca in the English Chalk is given in Sir C. Lyell's 'Anniversary Address' for 1836 (Geol. Proc., vol. ii, p. 365), and subsequently in the 'Elements of Geology' (1838, p. 55); a single valve of a Cytherella being there figured with other Microzoa obtained by Mr. Lonsdale from the Soft Chalk.

In M. Rœmer's work, 'On the Cretaceous Formation of North Germany,'[2] seven species of Entomostraca are figured and described, and in Dr. Reuss's work, 'On the Bohemian Chalk,'[3] seventeen species. M. Cornuel[4] has figured and described eight species with their varieties from the Neocomian formation of France, M. Bosquet[5] twenty species from the Maestricht beds, and Mr. Williamson[6] has given figures of five species from the Charing Detritus, with provisional names.

There is much confusion in the nomenclature of these species, arising from the imperfect descriptions and not very clear figures of MM. Rœmer and Reuss, whilst MM. Cornuel and Bosquet have renamed certain species already noticed by the former. Altogether thirty-eight distinct and seven doubtful species belonging to the Cretaceous system have been hitherto noticed.

Each of the above-mentioned writers, with the exception of M. Cornuel, has made

[1] Mr. Harris has obliged me with the following description of the character and locality of the "Detritus." The village of Charing stands on a bank of "chalk-detritus," composed of fragments of white and grey chalk, which gradually decrease in size from blocks of one or two feet in diameter, lying at the top, to very minute fragments, succeeded by still finer particles forming a clay-bed, which, in general, reposes on the Chlorite-marl (Glauconite). This bank extends from the southern escarpment of the adjacent hills, which form part of the northern boundary of the Weald of Kent, in a gradual descent southward for more than half a mile, where a hollow is formed occupying an area of about fifteen acres, and surrounded by chalk-detritus, except at one point, where a rivulet carries off the streams from the chalk-hills. In this hollow beneath the vegetable soil, and also under the banks of detritus, lies the clay-bed above mentioned, varying from one to twelve feet in depth, of a greyish colour and tough consistence, and containing nodules of undecomposed white and grey chalk and of ochreous and argillaceous substances. This bed abounds with many varieties of Amorphozoa, Zoophyta, Annelida, Polythalamia, and Entomostraca, with fragments of several species of other Crustacea and of Echinodermata, and with many specimens of Conchifera, Brachiopoda, and Cephalopoda; also with bones, teeth, and scales of fish. From its general and palæontological characters, this bed would seem to have been formed from the washings of the neighbouring chalk-hills at the time they received their present undulated contour.—W. H.

[2] Verstein. Norddeutsch. Kreidebirg. 1840.

[3] Verstein. Böhm. Kreideform. 1845.

[4] Mém. Soc. Géol. de France, 2e sér., tom. i, p. 193, 1846; tom. iii, p. 241, 1848.

[5] Descript. Entom. foss. Maestricht. 1847.

[6] Memoir on some Microscopical Objects, &c. 1847.

use of the term *Cytherina*, introduced by Lamarck ;[1] Münster, however, in his paper 'On Some Fossil Species of Cypris and Cythere,'[2] had retained Müller's original generic appellation, *Cythere*,[3] to which we return after the example of Latreille,[4] Baird,[5] Milne Edwards,[6] &c.

Dr. Reuss[7] has classified his species into "*Simplices*," "*Marginatæ*," "*Cornutæ*," and "*Concentricæ*." The "Simplices" comprise *Cytherella*, nob., which may justly be termed "Simplex," and *Bairdia*, M'Coy, which differs materially from the last; "Marginatæ" and "Cornutæ" divide *Cythereis*, nob., between them; and the "Concentricæ" are analogous to *Cythere proper*, which, however, has by no means always concentric markings.

M. Bosquet's *Cytherinæ* comprise the sub-genera *Cytherella*, nob., and *Bairdia*, M'Coy, and to *Cythereis* and *Cythere proper* he has applied the generic appellation *Cypridina*, used by MM. Milne Edwards and de Koninck to designate a very different form of branchiopod, in which genus M. Bosquet's *Cyprella ovulata*,[8] and *Cyprella Koninckiana*[9] ought most probably to be placed.

Previous to making any observations on the species which we have collected from the English Chalk and its accompanying strata, it will be necessary to take a rapid view of the characters of some of the recent Branchiopoda.

The Entomostraca, Müller, composing Latreille's Second General Division of Crustacea,[10] and previously to Müller's investigations known as the "Monoculi," are minute, insect-like animals, found in fresh, brackish, and salt water. Their bodies are furnished with a horny tegument of slender consistence, variously shaped in different families. This carapace in some resembles a cuirass, in others a shield, and in a large section it is very similar to the bivalve shell of a mollusc. Hence the appellation "shell insects," given them by O. F. Müller in his elaborate monograph on these minute Crustaceans.

The entomostracous Crustaceans which possess masticatory organs and have branchiæ attached to the feet and jaws are comprised in the Legion Branchiopoda.

[1] Hist. Nat. Anim. sans Vertèbres, 1st edit. 1818. [2] Jahrbuch für Miner. &c. 1830.
[3] Entomostraca, &c., p. 36, 1785. [4] Hist. Nat. Crustacés, &c., tome iv, p. 249, 1801.
[5] Mag. Zool. Bot. vol. ii, p. 138, 1838. [6] Hist. Nat. Crustacés, &c., tome iii, 1838.
[7] Op. cit. p. 104. [8] Op. cit. p. 22, pl. iv, fig. 4. [9] Op. cit. p. 22, pl. iv, fig. 5.

[10] For Latreille's classification and general history of the Crustacea consult the fourth volume of Cuvier's 'Règne Animal,' sec. édit. 1829 ; the thirteenth volume of Griffiths's 'Translation,' 1833 ; the third volume of Henderson's edition, 1837 ; and Westwood's 'Translation,' 1848. See also 'Penny Cyclopædia,' vol. v, art. Branchiopoda and vol. ix, art. Entomostraca. For the bibliography and anatomy of the Branchiopoda consult Dr. Baird's elaborate papers on the British Entomostraca, in the first and second volumes of the 'Magazine of Zoology and Botany,' 1837-8; in the 'Annals Nat. Hist.,' vol. i, 1838; 'Annals and Mag. Nat. Hist.,' vol. xi, 1843 ; vol. xvii, 1846 ; and second series, vol. i, 1847 ; and in the 'Transactions of the Berwickshire Naturalists' Club,' vol. i, No. 3, 1835 ; and vol. ii, No. 13, 1845. See also M. Milne Edwards's 'Hist. nat. des Crustacés,' tom. iii, pp. 391 et seq.

These are divided by Latreille into two orders, the Lophyropa and Phyllopa; the former of which he has subdivided into three sections, Cladocera, Ostracoda, and Copepoda, the types of which are the common Daphnia (water-flea), Cypris, and Cyclops of the ponds and ditches. It is to the second of these sections that our attention is at present directed.

The recent genera of this section have been well defined, their distinctive characters being taken from the number and position of the limbs, and other soft parts of the animal. The Ostracoda have a bivalve shell or carapace, the valves being united at their dorsal margins by a ligamentous hinge and muscles, and which, when shut, perfectly inclose the body and limbs of the animal. This peculiar carapace, although resembling in general form and in its adaptation to the animal the bivalve shell of the Conchifera, is essentially different from it, being analogous to the carapace or large dorso-thoracic tegumentary piece of the decapodous Crustaceans. We may remark that the framework or solid parts of the Crustacea consist of a series of rings, the normal number of which is twenty-one. M. Audouin has demonstrated that each ring is composed of eight elementary pieces, and is divisible into two arcs, the superior or dorsal and the inferior or ventral, each arc being formed of four pieces. The *tergum*, or upper surface of the dorsal arc, is formed of two of these pieces united in the median line, and the superior arc is completed at the sides by two other pieces, the *flancs* or *epimeral pieces*. The inferior arc is similar in composition, having two *sternal pieces* in the median line, flanked by two *episternal pieces*, which meet the *epimera*.

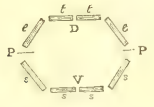

Diagram of the elementary parts of a "ring" of the dermo-skeleton of Crustacea.

D, dorsal arc; *t*, *t*, tergal pieces; *e*, *e*, epimeral pieces; V, ventral arc; *s*, *s*, *s*, *s*, sternal and episternal pieces; P, P, insertions of the extremities.

The carapace of Crustacea is generally formed from the superior arc of the third or fourth cephalic rings of the tegumentary skeleton by excessive development of either the *tergal* or the *epimeral pieces*. "In Limnadia, Cypris, &c., the pieces which are analogous to the *epimeral* or *lateral pieces* of this cephalic buckler acquire a great extension, whilst the *tergal* portion of the arc to which they belong continues rudimentary or proves entirely abortive, so that they constitute two large valves, containing the whole body of the animal, and bearing a considerable resemblance to the shells of certain acephalous molluscs." (Milne Edwards, in Todd's Cyclopædia of Anatomy and Physiology, art. CRUSTACEA.)

These Entomostraca have two pairs of jaws, with a pair of mandibles, and a lower lip or sternum (so called), two pairs of antennæ, the lower pair being denominated by Milne Edwards the "pediform antennæ," two or three pairs of feet, and a tail formed of two laminæ. The superior antennæ are plumed and natatory, and in some genera the pediform antennæ are likewise adapted for swimming; but in others these inferior antennæ are unprovided with setæ and like true legs are used only in creeping. The posterior pair of legs, except in Cythere, are not protruded from the shell like the

others, but are bent backwards and upwards for the support of the ovaries. In one genus, Cypridina, there are two separate eyes, one on each side of the median line of the body, but in general the eye is single, that is, coalesced; it is situated near the back and rather anteriorly.

The *Cypris*, Müller,[1] is the best known genus of this section. It is found only in fresh water; and many species may be readily taken among the weeds of our brooks and ponds. It has two pairs of antennæ, both plumose, and two pairs of feet. It is very active, swimming rapidly, chiefly by means of its antennæ, or creeping more leisurely on the submerged water-plants.

The *Candona*, Baird,[2] inhabits fresh and brackish waters, and is of a larger size than the foregoing. It has two pairs of antennæ, the superior pair only being furnished with long setæ, and two pairs of feet. Having the inferior antennæ hooked merely and not plumed it is unable to swim; its movements are sluggish, and it lives chiefly on or beneath the surface of the mud. This genus, previous to Dr. Baird's researches on the natural history of the British Entomostraca, was confounded with the foregoing.

Both of these genera occur in a fossil state, the latter in the Pliocene fresh-water deposit at Grays, Essex; the former in the Carboniferous, Wealden,[3] and Tertiary formations.

The *Cythere*, Müller,[4] has three pairs of feet, all protruded from the shell; the antennæ are simple; and the pediform antennæ, instead of a bundle of setæ, as in Cypris, possess one stout, articulated filament. This animal is marine,[5] probably altogether littoral, creeping at the bottom and among sea-weed.

The fossil remains of Cythere and its subgenera are very abundant, especially in the Lias and the various members of the Oolitic, the Cretaceous, and the Tertiary formations. They occur also in the Carboniferous and Magnesian limestones, and in the Silurian rocks.

The genus *Cypridina*, Milne Edwards,[6] is marine, and has been taken in deep water only. It is furnished with two eyes, two pairs of antennæ, one pair of natatory feet, and a pair of oviferous feet.

Three fossil species from the Carboniferous rocks of Belgium have been figured and described by M. de Koninck,[7] one species from the Carboniferous limestone of

[1] Entom. pp. 36, 54 et seq. Baird, Mag. Zool. Bot., vol. i, pp. 518 et seq.; and Ann. Mag. Nat. Hist., vol. xvii, p. 413.

[2] Trans. Berw. Nat. His. Club, vol. ii, p. 152, 1845. Ann. Mag. Nat. Hist., vol. xvii, p. 414.

[3] There is, however, reason to believe that some, if not all, of the species found fossil in the Wealden are more nearly allied to the genus Candona than to Cypris.

[4] Entom. pp. 36 et seq., 63 et seq. Baird, Mag. Zool. Bot., vol. ii, pp. 138 et seq.; and Ann. Mag. Nat. Hist., vol. xvii, p. 414.

[5] Dr. Baird informs me that a fresh-water species has lately been discovered.

[6] Hist. nat. Crust., tome iii, p. 407. Hist. nat. Anim. s. Vert., sec. édit., tom. v, p. 178. Baird, Ann. Mag. Nat. Hist., second series, vol. i, pp. 21 et seq.

[7] Mém. Crust. foss. Belgique, 1841. Descript. Anim. foss. terrain Carbonif. Belgique, 1842.

Ireland by Mr. M'Coy,[1] and two species from the Maestricht limestone by M. Bosquet.[2]

Of the fossil Entomostraca nothing remains but the carapace-valves; it is, therefore, by these alone that specific and even generic distinctions can be recognised. And although the general form and markings, used by Dr. Reuss in his classification, cannot alone be depended upon in subdividing this group, yet the peculiar characters of the dorsal margins of the valves are sufficiently distinct and constant to enable us to arrange these animalculites into sections which bear considerable, if not perfect, analogy to the subdivisions of the recent genera. We have therefore grouped the Cretaceous species into four sections, according to the characters of the hinge. These sections, although well marked, can scarcely rank as true genera, on account of the absence of all knowledge of the soft parts, on which the division of the recent branchiopods into genera depends.

Ostracoda having carapaces characteristically distinct are at present united in some of the recent genera; and besides the peculiar forms of carapace of existing species there is at least one other also present among the fossil Ostracoda. These peculiarities in the structure of the carapace-valves are especially apparent at the contact-margins and the dorsal borders; the former varying very much in their mode of adaptation to one another, and the latter being either simple or provided with a more or less complicated hinge. These characters have not hitherto been regarded as generic distinctions among the recent Ostracoda; but in the fossil species of this order, where the carapace-valves are our only guide in arrangement, these structural differences are of primary importance.

Three forms of carapace in particular are present among the recent Cytheres and exist also among their fossil congeners. We have reserved the term *Cythere* for the form belonging to four of the five species of Cythere figured and described by Müller, the first two and the last two, viz., *Cythere viridis*[3] and *C. lutea*,[4] *C. gibba*[5] and *C. gibbera*,[6] Müller; also to *C. reniformis*,[7] Baird, &c. The form peculiar to *Cythere variabilis*[8] and *C. aurantia*,[9] Baird, and perhaps *C. flavida*,[10] Müller, belongs to the group composing Mr. M'Coy's genus *Bairdia*;[11] but in accordance with the views above mentioned we can at present regard it as a sub-genus only. *Cythereis* is a sub-genus, comprising a third form, rare among the recent Ostracoda (and hitherto unpublished), but plentiful in the Cretaceous and Tertiary formations. Lastly, another distinct form, found fossil only, constitutes our sub-genus *Cytherella*.

[1] Under the name of *Daphnia primæva*, Syn. charact. &c. p. 164.
[2] Described as *Cyprellæ* by M. Bosquet, op. cit. p. 22.
[3] Entomostr. tab. vii, figs. 1, 2.
[4] Op. cit. tab. vii, figs. 3, 4.
[5] Op. cit. tab. vii, figs. 7-9.
[6] Op. cit. tab. vii, figs. 10-12.
[7] Mag. Zool. Bot., vol. ii, pl. v, fig. 17.
[8] Op. cit. pl. v, fig. 25.
[9] Op. cit. pl. v, fig. 26.
[10] Entomostr. tab. vii, figs. 5, 6.
[11] Synop. charact. &c., p. 164, 1844.

The genera *Cyprella*[1] and *Cypridella*[2] have been established by M. de Koninck for the reception of certain species found in the Carboniferous strata of Belgium; whilst *Entomoconchus*[3] of Mr. M'Coy, and *Daphnoidea*[4] of Dr. Hibbert, comprise certain branchiopods of the carboniferous system of Great Britain and Ireland.

General Division—ENTOMOSTRACA, *Müller.*

Legion BRANCHIOPODA,[5] *Latreille.*

Order OSTRACODA, *Latreille.* 1801. Hist. nat. Crust.

OSTRACINS *ou* BITESTACÉS, *Dumeril.* 1806. Zoologie Analytique.
OSTRAPODA, *Straus.* 1821. Mém. du Muséum, tom. vii.
— *Milne Edwards.* 1830. Annal. Scien., tom. xx.
OSTRACODES *ou* CYPROÏDES. — 1834. Hist. nat. Crust.
OSTRACODA, *Baird.* 1837. Mag. Zool. Bot., vol. i.

We have already noticed in detail the characteristic parts of the recent ostracodous Entomostraca; we may add that the carapace-valves are more or less oblong in outline, longer from the anterior to the posterior extremity than from the superior (dorsal) to the inferior (ventral) margin; they are rarely equilateral, and vary considerably in the depth of their internal cavity, sometimes being hemispherical in section, and sometimes presenting but an exceedingly shallow cavity. The carapace is always inequivalve, the left valve being the largest in nearly every species,[6] except in those of our sub-genus *Cytherella*, where the opposite condition obtains. The margin of the larger valve has a more or less distinct groove or rabbet for the reception of the edge of the opposite valve. The mode in which the valves are attached at their dorsal borders varies from a simple groove and ridge to more or less complicated hinges provided with teeth. In the centre of each of the valves of *Cypris*, *Candona*, and *Bairdia*, in the recent state, there frequently exists a patch of lucid spots,[7] varying in size and pattern. The nature and use of these spots are at present obscure, the eye never being placed opposite or even near to them. Some fossil species of Bairdia exhibit traces of these patches, but we have never observed any specimens of *Cytherella* to afford evidence of such spots; on the contrary, a small tubercle peculiar to Cytherella constantly presents

[1] Descript. Anim. foss. &c., p. 589. [2] Op. cit. p. 590.

[3] Journal Geolog. Soc. Dublin, vol. ii, tab. vi. Synop. charact. &c., p. 164.

[4] Trans. Roy. Soc. Edinburgh, vol. xiii, p. 180.

[5] First applied by Schœffer to a group of three or four genera of the Entomostraca.

[6] *Bairdia Siliqua*, nob., is an exception, and appears to be the only species, besides the Cytherellæ, that has the right valve larger than the left.

[7] Mag. Zool. Bot., vol. i, p. 518; vol. ii, pl. v, figs. 2, 4, 5, 6, 15, 16*. Lucid spots may be observed also in the recent *Bairdia subdeltoidea*, and, though less distinctly, in *Cythere* (*Bairdia*) *aurantia*, Baird, and in the fossil *Cythereis interrupta*.

itself near the centre of the *inside* of each of the valves, without any corresponding pit or pits existing on the external surface. In *Cythereis* a large external tubercle is always present on the central line in the anterior third of each valve, having a corresponding internal circular pit. How far M. de Koninck may be correct in considering similar tubercles existing in *Cypridina*[1] to be adapted to the eyes of the animal we are not prepared to say; and, although the sub-genus Cythereis exists in the recent state, we have hitherto met with dead valves only, and have had no opportunity of examining what relation the eyes may have to these tubercles in a living specimen. In *Cythere proper* the tubercle referred to above is not present; a slight central pit, however, sometimes exists on the internal surface of the valves. Lastly, the exterior of the carapace-valves of the Ostracoda varies from a perfectly smooth convexity to a flat or irregular surface, variously ridged, tubercled, granulated, spined, reticulated, or pitted.

Genus Cythere, *Müller.*

Cythere, *Müller.* 1785. Entomostrac.
Monoculus, *Gmelin.* 1791. Syst. Nat., ed. 13.
— *Fabricius.* 1792. Entom. Syst.
— *Manuel.* 1792. Encycl. Méthod. Hist. nat., tom. vii.
Cythere, *Latreille.* 1802. Hist. nat. Crust.
— *Bosc.* 1802. Hist. nat. Crust.
— *Dumeril.* 1806. Zool. Anal.
Cytherina, *Lamarck.* 1818. Hist. nat. An. s. Vert. first ed.
Cythere, *Straus.* 1821. Mém. du Muséum, tom. vii.
— *Desmarest.* 1825. Considé. génér. Crust.
Cytherina, *Hisinger* and *Nilsson.* 1827. Petrif. Suec.
Cythere, *Münster.* 1830. Jahrb. f. Miner. &c.
— *Milne Edwards.* 1834. Hist. nat. Crust.
Cytherina, *Sowerby.* 1834. Geol. Trans., sec. ser. vol. v.
Cythere, *Baird.* 1838. Mag. Zool. Bot., vol. ii.
Cytherina, *Lyell* and *Lonsdale.* 1838. Elem. Geolog.
— *Rœmer.* 1838. N. Jahrb. f. Miner. &c.
— — 1840. Verstein. Kreid. &c.
Cythere, *De Koninck.* 1842. Descript. Anim. Foss. &c.
— *M'Coy.* 1844. Synop. Charact. Foss. &c.
Cytherina, *Phillippi.* 1844. Tertiær. Verstein. &c.
— *Reuss.* 1845. Verstein. Böhm. Kreid.
Cythere, *Cornuel.* 1846. Mém. Soc. Géol. France, sec. sér. tom. i.
Cytherina, *Williamson.* 1847. Trans. Manchest. Lit. Phil. Soc., vol. viii.
— *Bosquet.* 1847. Mém. Soc. Roy. Scienc. Liège, tom. iv.

Generic Characters.—The section of this genus, for which we reserve the term *Cythere proper,* is characterised by a general resemblance of the closed carapace to a

[1] Descript. Anim. foss. &c. p. 586.

peach-stone. The valves are irregularly oval and gibbous, spinous at their anterior and posterior borders, and generally marked by punctations or by reticulated wrinkles. The contact-margin of the dorsal border of each valve has, occupying its central third, a longitudinal ridge or bar, and an accompanying furrow. In the right valve the ridge is next to the outer edge, and the furrow lies within the ridge; in the opposite valve the furrow lies just within the edge of the margin and the ridge on the inner side of the furrow; consequently, the ridge or bar of one valve fits the furrow of the other, and *vice versâ*. The bars are narrow, rounded, polished, and finely crenulate or "knurled." The anterior and posterior extremities of these bars afford processes or teeth, forming the anterior and posterior hinges of the carapace. In the right valve the hinge-teeth are prominent, and, owing to the proximity of the bar to the outer border, they sometimes appear to form part of the outer edge of the shell. On their inner or lower side are placed cavities for the reception of the hinge-teeth of the opposite valve. In the left valve the teeth are less strongly developed, especially at the posterior extremity of the hinge-bar, and have the accompanying tooth-sockets and the long furrow on their outside, separating them from the outer edge of the shell. The anterior, ventral, and posterior margins of the right (smaller) valve are trenchant and bevilled off internally, and lie within the similarly formed but overlapping edges of the left (larger) valve, a slight groove or ledge for their reception being generally apparent. The middle of the ventral border of each valve is somewhat incurved, and bears a thin semilunar process projecting from the contact-margin, termed by M. Cornuel "la lame pectorale." These laminæ are formed by a local increase of the outermost or free edge of the margins, and in the closed carapace the lamina of the smaller valve lies within that of the larger, a slight cavity or sinus being provided for its reception.

This section is connected in the form of shell and mode of hingement with certain recent *Candonæ* by the Cretaceous species *Cythere Hilseana*, Rœm. In the Candonæ referred to the hinge-bars are simple and not produced at their extremities into teeth, but merely "knurled" throughout their length: in *C. Hilseana* the bars are but slightly modified, the hinge-bar of the right valve being somewhat thickened at its anterior and posterior extremities, and marked with three or four knurlings stronger than those on the rest of the ridge, the opposite valve having cavities to receive them. In these Candonæ, and in *Cythere Hilseana*, the contact-margin of the right valve has a flange, which is received into a corresponding groove in the larger valve. In other species of *Cythere proper* the groove and flange become nearly obsolete. A mode of contact, similar to the above, obtains in our sub-genera *Cythereis* and *Cytherella;* the groove and flange, however, in the latter, are much more distinct and uniform along the contact-margins; and, moreover, in Cytherella it is the right valve that is grooved, and the left that is flanged, the contrary condition to that which exists in Cythere and Cythereis.

The species belonging to this section that occur in the Cretaceous strata are not

numerous, and we have not found more than four or five additional forms in the Lias and in the Lower and Upper Oolites. In the Tertiary Formation, however, and in the recent state the species are far more varied and abundant.

No 1. Cythere Hilseana, *Rœmer*. Tab. I, fig. 1. *a—g*.

Cytherina Hilseana, *Rœmer*. 1840. Verstein. Norddeutsch. Kreid. p. 104, n. 1, pl. xvi, fig. 17.
— — *Reuss*. 1845. Verstein. Böhm. Kreid. p. 16, pl. v, fig. 39 *a*, *b*.

	INCH.			
Length,	$\frac{1}{30}$	$\frac{1}{25}$ [1]	Greensand, Blackdown.	Eocene Sand, Colwell Bay, Isle of Wight.
Height,	$\frac{1}{40}$	$\frac{1}{40}$	Gault, Folkstone and Leacon Hill.	— Lower Fresh-water Formation, Isle of Wight.
Thickness,	$\frac{1}{50}$	$\frac{1}{50}$	Chalk-marl, Dover.	— Clay, Barton, Hants.
			Detritus, Charing.	Miocene, Coralline Crag, Walton.

Hils-clay, North Germany (*Rœmer*). Chalk-marl and Chalk, Bohemia (*Reuss*). Chalk, Balsberg, Sweden.

Carapace sub-triangular. *Valves* convex, finely punctate, and hairy.[2] The internal surface of the valves is also covered with hairs, especially near the dorsal border. *Dorsal border* elliptical in the left (larger) valve, and rather angular in the right (smaller) valve; *ventral border* almost straight. *Anterior extremity* obliquely semicircular; *posterior* subacute, pointing obliquely downwards. Both extremities are provided with spines, especially on their inferior moieties.

Dorsal aspect acute oval; *anterior* ovate.

Just within the anterior hinge each valve exhibits a small circular pit, peculiar to this species, marked externally by a corresponding protuberance. In *C. Hilseana* the hinges are less developed than in the generality of Cytheres, especially as regards the hinge-teeth, which are merely the knurled extremities of the hinge-bar; and, contrary to what obtains in other species, the hinges are equally developed anteriorly and posteriorly.

This species is abundant in the Gault, and is of frequent occurrence in the Chalk-marl and the Detritus, it is found also in the Greensand; it is not present, however, in the English Chalk, although occurring in the Chalk of Bohemia and of Balsberg. It is described by M. Rœmer as found in the Hils-clay[3] of Hilse, North Germany.

An apparently identical species is found in the Lower Fresh-water (so-called) For-

[1] In this and the following instances each column of fractions represents the dimensions of an individual.

[2] The delicate external characters of this and other species are well preserved in the Gault. The specimens from the other Cretaceous strata have their markings and spines more or less worn.

[3] The Hils-clay (Hils-thon), according to M. Rœmer, is the lowest member of the Neocomian series, lying upon the Weald-clay, and representing the Speeton-clay, which latter, in M. Rœmer's opinion, belongs to the Neocomian group. (See Translation of Appendix to Rœmer's North Germany Chalk Formation, in Taylor's 'Scientific Memoirs,' vol. iv, art. 5.)

mation and in the Eocene Colwell Bay Sands, Isle of Wight, and also in the Coralline Crag. Allied forms occur in the Lias and in the Tertiary beds, both British and foreign.

No. 2. CYTHERE PUNCTATULA, *Rœmer*. Tab. I, fig. 2 *a*—*n*.

CYTHERINA PUNCTATULA, *Rœmer*. 1840. Verstein. Kreid. p. 104, n. 2, pl. xvi, fig. 18.
— CONCENTRICA, *Reuss*. 1845. Verstein. Böhm. Kreid. p. 104, n. 17, pl. xxiv, fig. 22, *a*, *b*, *c*.
CYTHERE SCULPTA, *Cornuel*. 1846. Mém. Soc. Géol. de France, 2 sér. tom. i, 2 part. p. 201, n. 4, pl. viii, figs. 20-23.
CYTHERINA CONCENTRICA, *Williamson*. 1847. Trans. Manchest. Phil. Soc. vol. viii. Memoir on some, &c., p. 82, pl. iv, fig. 77.
CYPRIDINA RŒMERIANA, *Bosquet*. 1847. Entom. foss. Maestricht, p. 12, n. 4, pl. ii, fig. 2 *a-f*.

	INCH.		
Length,	$\frac{1}{40}$	$\frac{1}{28}$	Greensand, Warminster.
Height,	$\frac{1}{65}$	$\frac{1}{40}$	Gault, Folkstone and Leacon Hill.
Thickness,	$\frac{1}{65}$	$\frac{1}{40}$	Chalk-marl, Dover.
			Detritus, Charing.
			Chalk, South-east of England.

Hils-clay, North Germany (*Rœmer*).
Inf. Greensand, France (*Cornuel*).
Chalk-marl, Bohemia (*Reuss*).
Chalk, Maestricht (*Bosquet*).

Carapace irregular ovate. *Valves* strongly convex, especially on the lower or ventral portion; in young specimens, covered with reticulations, the meshes arranged somewhat concentrically, the ridges or raised part of the network armed with fine spines. In adult shells these ridges lose their spines and become thickened, encroaching on the meshes, until the latter appears as minute and more or less concentric punctations. In very old individuals there remain only the ridges or coarse wrinkles, strongly marked and regular on the ventral part of the valves, but fainter on the dorsal part, and on the central surface broken up into irregular corrugations. *Dorsal margin of the left* (larger) *valve* elliptical; *of the right valve* less arched and sinuous; *ventral margin* nearly straight, compressed inwards, overhung by the convexity of the valve. *Anterior extremity* rounded, having a slight, flat, bearded lip; *posterior extremity* somewhat narrower than the anterior, shelving to a flat subacute lip.

Dorsal aspect subacute oval; *anterior* sub-cordate.

The considerable variation of shape and relative size to which the individuals of this species are subject, and the very different conditions in which the valves occur have been the cause of its receiving three or four distinct appellations. In the Greensand, the Chalk-marl, the Detritus, and the Chalk the valves are generally much smoothed down or worn, leaving nothing but the coarse wrinkles or the punctations (according to the age of the individual) apparent. In the Gault, however, we find individuals of all ages, and in consequence of the high state of preservation in which

they occur in this argillaceous deposit, we have the opportunity of studying them in all stages of growth.

We conceive that M. Bosquet's *C. Rœmeriana* cannot be said to differ in any essential point from M. Cornuel's *C. sculpta*, which latter, if our observations on the stages of growth be correct, is only the unworn adult form of *C. punctatula*, Rœmer; whilst the figure and description of *C. punctatula* are sufficiently characteristic of the species which Dr. Reuss and Mr. Williams have named *C. concentrica*, to enable us to place the whole under the above-mentioned specific appellation used by M. Rœmer, who found this species in the Hils-clay of Hilse.

Variety, *Virginea*. fig. 2 *n*.

Detritus, Charing. Chalk, Gravesend.

This variety is similar to the above in every respect, except that it is devoid of superficial reticulations, wrinkles, or punctations; some valves, however, viewed by transmitted light, show faint traces of a reticulated structure.

Forms of Cythere allied to the above occur in the Oolites, supplying the majority of species to the Forest-marble, Fuller's Earth, Upper Oolite, &c. They are also plentiful in the Tertiary beds and in the recent state.

No. 3. CYTHERE UMBONATA, *Williamson*. Tab. II, fig. 3 *a*—*g*.

CYTHERINA UMBONATA, *Williamson*. 1847. Trans. Manchest. Phil. Soc. vol. viii. Memoir on some, &c., p. 82, pl. iv, fig. 78.

		INCH.	
Length		$\frac{1}{40}$	Chalk-marl, Dover.
Height		$\frac{1}{60}$	Detritus, Charing.
Thickness	inclusive of lateral projections,	$\frac{1}{60}$	Chalk, Norwich and Woolwich.
	exclusive of lateral projections,	$\frac{1}{80}$	

Carapace irregular oblong. *Valves* sub-concentrically punctated, in the young individual depressed, convex in the adult, at all ages bearing a strong, oblique process, spine, or umbo, hollow and conical, placed on the median line, and rather posteriorly. *Dorsal edge* straight; *ventral* somewhat elliptical. *Anterior extremity* rounded, slightly bearded; *posterior* oblique, subacute at its dorsal angle. The hinges are but feebly developed; the distance between the anterior and posterior hinge is greater than in the generality of the species of this group.

Dorsal and ventral aspects four-lobed, somewhat cruciform; *posterior* irregularly pentagonal.

This rare and interesting species, first noticed by Mr. Williamson, in the 'Transactions of the Manchester Philosophical Society,' as occurring in the Charing Detritus, is found also in the Dover Chalk-marl, and in the Chalk of a few localities.

A somewhat allied species, having two projections or bosses on each valve, instead of one only, occurs in the Forest-marble.

No. 4. CYTHERE FABA, *Reuss.* Tab. II, fig. 4 *a—c.*

CYTHERINA FABA, *Reuss.* Verstein. Böhm. Kreidf. p. 104, n. 9, pl. xxiv, fig. 13.

	INCH.	
Length,	$\frac{1}{30}$	Detritus, Charing.
Height,	$\frac{1}{35}$	
Thickness,	$\frac{1}{75}$	Chalk-marl, Bohemia (*Reuss*).

Carapace irregular oblong, somewhat bean-shaped; *anterior half* narrower than the *posterior*. *Dorsal border* elliptical; *ventral* incurved at its anterior third; *anterior extremity* obliquely rounded; *posterior* subacute.

Dorsal aspect compressed oval; *anterior* oval.

This species (of which we have but one specimen) appears to be identical with *C. Faba*, Reuss, described by him as found in the Plänermergel of Bohemia. In the Upper Oolite there is a Cythere, occurring in great numbers, which in its young state is like the species under notice, but when adult, is somewhat elongated and incurved on the dorsal and ventral margins, not unlike var. *pyriformis* of *C. amygdaloides*, Cornuel (Ent. foss. &c., pl. 8, fig. 11).

No. 5. CYTHERE BAIRDIANA, *nobis.* Tab. II, fig. 5 *a—c.*

	INCH.	
Length,	$\frac{1}{35}$	Greensand, Farringdon.
Height,	$\frac{1}{75}$	
Thickness,	$\frac{1}{80}$	

Carapace-valve (right) somewhat triangular, convex, obliquely rounded *anteriorly;* subacute *posteriorly;* punctated; *punctations* coarse, arranged somewhat longitudinally; *Dorsal margin* somewhat produced at the anterior hinge; *ventral margin* slightly incurved. *Anterior hinge* provided with a prominent, oblong tooth, with a cavity on the inside at its base. *The valve* in profile nearly straight, rather less gibbous at the anterior than at the posterior extremity. A single valve, with its characters somewhat obscured by crystallization, was the only specimen found; it closely approaches *C. Mülleri*, Münster, (Jahrbuch 1838, p. 516, n. 6, pl. vi, fig. 6,) but is very much smaller, more obtuse posteriorly, and differs materially in the character of its anterior hinge, having a prominent hinge-tooth, which is obsolete in *C. Mülleri*, and a large oval tooth-socket, which in *C. Mülleri* is long and narrow.

This species we have named in compliment to Dr. Baird, who has so greatly enriched the sciences of Zoology and Comparative Anatomy by his researches in the natural history of Entomostraca, &c.

Subgenus *Cythereis*, nobis.

Synonyms. Cythere, *Münster*. 1830. Jahrbuch für Mineralogie, &c.
Cytherina, *Rœmer*. 1838. Jahrbuch für Mineralogie, &c.
— — 1840. Verstein. Kreidberg.
— *Reuss*. 1845. Verstein. Böhm. Kreideform.
Cythere, *Cornuel*. 1846. Mém. Géol. Soc. France.
Cytherina, *Williamson*. 1847. Transact. Manchester.
Cypridina, *Bosquet*. 1847. Mém. Soc. Royale Liège.

The carapace-valves of *Cythereis* have an almost regularly oblong shape. The superior (dorsal) and inferior (ventral) borders of the valves lie nearly parallel to each other; the superior border, however, especially in the left (larger) valve, trends upwards as it approaches its anterior extremity, making at its junction with the anterior border a more acute angle than that formed by the junction of the anterior and ventral borders, and thereby leaving a greater space between the anterior hinge and the ventral margin, than between the same margin and the posterior hinge. The middle of the inferior border is slightly incurved. The anterior border is nearly semicircular, it is trenchant and bevilled off inwardly; its superior moiety is more or less compressed, and, as it were, drawn back to meet the dorsal border. The anterior third of the carapace-valves is always depressed. The posterior border is shorter than the anterior; it is more or less acute, its ventral moiety forming the segment of a circle, and the edge of its superior moiety suddenly returning in a straight or sinuous line to meet the dorsal border. This somewhat triangular extremity, occupying sometimes a fourth of the valve, is much below the level of the rest of the surface, being suddenly and strongly depressed. The inferior or ventral moieties of the anterior and posterior borders are always furnished with spines, and sometimes nearly the whole of the anterior border.

The dorsal half of the valve, or that superior to the median line, has always less convexity than the ventral or inferior half, which latter is frequently very strongly raised, taking an angular form, with the ventral surface of the valve at a right angle to its lateral surface; and as the ventral half of each valve gradually increases in thickness, as it recedes from the anterior extremity until it is abruptly terminated nearly opposite to the posterior hinge, the ventral aspect of the carapace is flat, and more or less of a triangular or sagittiform shape, varying, indeed, from an irregular oblong more or less elongate to a triangle, the posterior angles of which are sometimes far apart, and giving origin to Dr. Reuss's group of "*Cornutæ*." The dorsal aspect, on the contrary, is not flat, but angular or culminate, narrow in front, and increasing in width backwards towards the ventral keels. For the same reasons the anterior aspect of the carapace is generally triangular, acute superiorly, and inferiorly more or less extended.

On the valves three eminences or tubercles are more or less strongly developed; one rather anterior to the centre, which is very characteristic of this section, as pointed out by M. Bosquet (Op. cit., p. 10), and one at each angle formed by the junction of the posterior with the superior and inferior borders. From each of these last-mentioned tubercles a ridge generally arises, which is continued more or less uninterruptedly around the edge of the valve. This is characteristic of the "*Marginatæ*" of Dr. Reuss, but it is a character common also to the "*Cornutæ*," and found amongst the *Cytherellæ*, nob. The hinges are formed of the same elements as in *Cythere proper*, but the bars are scarcely distinct from the margins of the valves and the furrows are nearly obsolete; the hinge-teeth, however, and the sockets for their reception are more strongly developed than in *Cythere*. The hinge-margin, is proportionally longer than in *Cythere proper*, and consists of the straight dorsal edge, extending from the anterior to the posterior hinges, which respectively occupy the angles formed by the junction of the dorsal with the anterior and posterior borders. The hinge-margin of the *right* valve is narrow and trenchant; its anterior extremity is suddenly produced into a conical tooth, having a slight cavity on its inner aspect; the posterior extremity affords a smaller process, of an oblong shape, accompanied by a slight cavity similar to the above. In the *left* valve the hinge-margin bears a slight groove along its surface of contact, and at each of its extremities is a semicircular or horseshoe-shaped cavity or socket for the reception of the hinge-teeth of the opposite valve. These cavities are excavated in the valve-margin, which is thickened and projects outwards at the anterior and posterior angles of the dorsal border. The projection at the anterior hinge is the strongest, where it forms a semicircular process or ear-like appendage, which is peculiar to this section, as noticed by M. Bosquet (Op. cit., p. 10). Externally this process bears a tubercle corresponding to the cavity, and the summit of the tubercle is occupied by a small, highly polished, translucent bead. The anterior extremity of the hinge-margin is produced into a slight conical process, and forms the posterior boundary of the anterior socket; this socket is bounded in front by a narrow process running downwards at a right angle from the inner edge of the valve-margin, and terminating in a small conical tooth; so that this socket is accompanied by two small teeth, which, when the carapace is closed, fit to the inner or under side of the cardinal tooth of the right valve. The posterior extremity of the hinge-margin forms the anterior boundary to the posterior socket, and is furnished with a slight process, but this socket and its accompanying teeth are much less strongly developed than the similar parts of the anterior hinge.

The other margins of contact have an arrangement very similar to that in *Cythere proper*, except that the flange of the right and the groove of the left valve are generally more distinct, and the ventral laminæ more strongly developed.

This subgenus is more plentiful in the Cretaceous Formation than in the Tertiary deposits, or in the recent state.

No. 1. CYTHEREIS INTERRUPTA, *Bosquet*. Tab. II, fig. 6 *a—h*.

CYPRIDINA INTERRUPTA, *Bosquet*. 1847. Entom. foss. Maestricht, p. 12, n. 3, pl. ii, fig. 1. *a—d*.

VAR. *α* and *β*.

	INCH.	INCH.		
Length,	$\frac{1}{40}$	$\frac{1}{35}$	Greensand, Blackdown.	Var. *α*. Gault, Leacon Hill and Folkstone.
Height,	$\frac{1}{85}$	$\frac{1}{60}$	Detritus, Charing.	Var. *β*. Gault, Folkstone.
Thickness,	$\frac{1}{85}$		Chalk, Woolwich.	Var. *γ*. Greensand, Farringdon.

Chalk, Maestricht (*Bosquet*). Upper Oolite, Dorsetshire.

Carapace oblong. *Valves* convex, slightly depressed towards the dorsal border, usually pitted like the surface of a thimble; *punctation* subconcentric. *Anterior extremity* depressed, rounded, slightly bearded; *posterior* narrower, subacute; both *extremities* having a slight marginal ridge. *Superior and inferior margins* nearly straight; a slight ridge sometimes present near the ventral border. *Hinges* very slightly developed. *The central and the two posterior tubercles* nearly obsolete.

Dorsal and ventral aspects somewhat oblong; *anterior extremity* narrower than the *posterior*, strongly produced; *posterior* slightly produced. *Anterior aspect* somewhat oval.

This species occurs in the Charing Detritus; it is very rare in the Chalk and the Greensand. M. Bosquet describes it as occurring at Maestricht. It is found also in the Upper Oolite (white limestone with flints) at Upway, Dorsetshire.

Variety *α*, figs. 6*b*, 6*f*.

Gault, Leacon Hill, near Charing, and Folkstone.

In this variety the height of the valves is proportionally greater. The anterior and posterior margins are bearded; the anterior marginal ridge is strongly marked; the whole surface of the valves is bristled with fine spines; and the punctations are confined to the middle of the valves. Central tubercle is obsolete. The posterior tubercles are sometimes slightly acuminate. Near the centre of the valve in this and the following variety is observable (by transmitted light) a patch of 4-5 oval lucid spots arranged in two little groups, 3-4 small spots in the one, and 1-2 larger spots in the other group. Plentiful at Leacon Hill, near Charing, Kent.

Variety *β*, figs. 6*c*, 6*d*, 6*g*.

Gault, Folkstone.

Similar in size and shape to var. *α*; the valves are setaceous; central tubercle sometimes covered with closely set, short, strong spines. Punctations more or less obsolete. This variety is very plentiful in the Folkstone Gault.

Variety γ.

Greensand, Farringdon.

A mutilated valve of this species, from the Coralline bed at Farringdon, exhibits a surface covered with longitudinal lines of punctations, much smaller than those of the Charing specimens.

No. 2. CYTHEREIS GAULTINA, *nobis*. Tab. II, fig. 7 *a—c*.

	INCH.	
Length,	$\frac{1}{35}$	
Height,	$\frac{1}{75}$	Gault, Folkstone.
Thickness,	$\frac{1}{100}$	

Carapace nearly oblong, somewhat foot-shaped. *Valves* depressed. *Anterior extremity* rounded, edged with coarse spines; *posterior* contracted, coarsely spined. *Dorsal and ventral margins* nearly straight. A little within the anterior and posterior margins respectively, the surface of the valve is raised into coarse, semicircular ridges, following the outline of the extremities. The central surface rises into a low four-sided pyramid. The whole surface exhibits a beautiful arrangement of slightly raised network; the meshes are irregularly hexagonal, and occupied by a slight depression with a little central pit. The reticulations are cut across abruptly at the extremities, and the parietes of the meshes are there prolonged into coarse, obtuse spines. The hinges are slightly developed.

This rare and pretty little species occurs only in the Gault.

No. 3. CYTHEREIS MACROPHTHALMA, *Bosquet*. Tab. II, fig. 8 *a—b‴*.

CYPRIDINA MACROPHTHALMA, *Bosquet*. 1847. Ent. foss. Maestricht, p. 16, n. 10, pl. iii, fig. 3 *a—d*.

	INCH.	
Length,	$\frac{1}{30}$	
Height,	$\frac{1}{80}$	Chalk, Norwich.
Thickness,	$\frac{1}{100}$	

Chalk, Maestricht (*Bosquet*).

Carapace-valve somewhat oblong; irregularly gibbous; *anteriorly* obliquely rounded; *posteriorly* subacute. *Dorsal margin* more or less arched; *ventral* nearly straight. The valve bears an irregular marginal ridge, broad and convex on the dorsal border, narrow or obsolete elsewhere. The central tubercle is large and irregular, extending backwards. The hinges are very strongly developed.

This species is very rare, two odd valves only being found in the Soft Chalk at Thorpe, near Norwich: it is described by M. Bosquet as occurring at Sichen.

No. 4. CYTHEREIS TRIPLICATA, *Rœmer*. Tab. III, fig. 9 *a—h*.

CYTHERINA TRIPLICATA, *Rœmer*. 1840. Verstein. Kreidebirg, p. 104, n. 3, pl. xvi, fig. 16.
CYTHERE AURICULATA, *Cornuel*. 1846. Mém. Soc. Géol. de France, sec. sér., tom. i, sec. part., p. 200, n. 3, pl. viii, figs. 14-16.

	INCH.	
Length,	$\frac{1}{20}$	Gault, Folkstone and Leacon Hill.
Height,	$\frac{1}{45}$	Detritus, Charing.
Thickness,	$\frac{1}{45}$	Chalk, South-East England.

Hils-clay, North Germany (*Rœmer*).
Inferior Greensand, France (*Cornuel*).

Carapace ovate. *Valves* strongly convex, especially on ventral half; very finely punctate and hairy; bearing three longitudinal, convex ridges, three fourths the length of the shell, barely meeting posteriorly, free anteriorly; the lowest ridge the longest, the middle one the shortest; the dorsal and the central ridge smooth and not punctated, the ventral ridge coarsely pitted. *Central tubercle* large, forming the anterior extremity of the middle ridge. *Anterior extremity of the valve* semicircular, shelving abruptly to a flat lip, extending across the valve, and occupying a fourth of its length. *Posterior extremity* shelving, contracted, subacute.

Dorsal and ventral aspects subovate; the latter marked with three or four coarse, longitudinal wrinkles. *Anterior aspect* triangular.

This species occurs in the Gault, the Charing Detritus, and the Chalk; but is not at all plentiful. M. Rœmer describes it as occurring in the Hils-clay of Hilse. In the Bohemian Chalk-marl there is a nearly allied form, *C. semiplicata*, Reuss (Op. cit. p. 104, pl. xxiv, fig. 16), and there are others in the Maestricht Chalk, viz. *C. Forsteriana*, Bosq. (Op. cit. pl. ii, fig. 4), *C. pulchella*, Bosq. (Op. cit., pl. ii, fig. 5), and *C. elegans*, Bosq. (Op. cit., pl. iii, fig. 1); another of very similar characters is found in the Forest-marble.

No. 5. CYTHEREIS QUADRILATERA, *Rœmer*. Tabs. III and IV, fig. 10 *a—j'*.

CYTHERINA QUADRILATERA, *Rœmer*. 1840. Verstein. Kreideb. p. 105. n. 7, pl. xvi, fig. 19.
— ORNATISSIMA, bis, *Reuss*. 1845. Verst. Böhm. Kreid. p. 104, n. 12, pl. xxiv, fig. 18.
CYTHERE HARPA, *Cornuel*. 1846. Mém. Soc. Géol. de France, sec. sér., tom. i, sec. part., p. 199, n. 2, pl. viii, fig. 13.

	YOUNG. INCH.	IMMATURE. INCH.	ADULT. INCH.	ADULT. INCH.		
Length,	$\frac{1}{42}$	$\frac{1}{35}$	$\frac{1}{25}$	$\frac{1}{20}$	Gault, Folkstone and Leacon Hill.	Inf. Greensand, France (*Cornuel*).
Height,	$\frac{1}{100}$	$\frac{1}{50}$	$\frac{1}{50}$	$\frac{1}{40}$	Detritus, Charing.	Chalk-marl and Chalk, Bohemia (*Reuss*).
Thickness,	$\frac{1}{100}$	$\frac{1}{50}$	$\frac{1}{50}$	$\frac{1}{40}$	Chalk, South-East England.	Chalk, North Germany (*Rœmer*).
						Chalk, Weissböhla, Saxony.

Upper Oolite, Dorsetshire.

Carapace irregularly oblong. *Valve* depressed, smooth, shining, hairy. *Anterior extremity* obliquely rounded, having a flattened lip, longest in young individuals, with

a crenulated marginal ridge, bearded. *Posterior extremity* somewhat angular, with a slight, crenulated, marginal ridge, partially bearded. *Superior and inferior margins* nearly straight; each bearing a crenulated ridge, which in old specimens becomes spiny, especially on the ventral border, which is raised and keeled. *Central space* occupied by a prominent tubercle and a straight, crenulated, or interrupted ridge extending backwards. In the young shell the tubercle and ridge are continuous, forming a club-shaped mass. *Hinges* moderately developed.

Dorsal aspect somewhat oblong, with its anterior and posterior extremities strongly produced. *Ventral aspect* somewhat obovate, produced at each extremity. *Anterior aspect* triangular, five-lobed.

This species occurs in the Chalk and the Detritus, and is exceedingly abundant in the Gault, in which the largest-sized specimens are found. M. Rœmer describes the young form as *C. quadrilatera* from the Upper Chalk-marl (the lowest strata of the Soft or Upper Chalk), at Geherden.[1] M. Reuss, under the name of *C. ornatissima*, describes two somewhat allied forms from the Lower Chalk and the Chalk-marl of Bohemia, and M. Cornuel describes this species as *C. Harpa* from the "argile astréene" of Haute-Marne. It is present in the Wemböhla Chalk, and also in the Upper Oolite (white limestone with flints) at Upway, Dorset.

No. 6. CYTHEREIS CILIATA, *Reuss*. Tab. IV, fig. 11 *a*—*h'*.

CYTHERINA CILIATA, *Reuss*. 1845. Verst. Kreid. p. 104, n. 13, pl. xxiv, fig. 17.
— ECHINULATA, *Williamson*. 1847. Trans. Manchest. Phil. Soc., vol. viii. Memoir on some, &c. pl. iv, figs. 75, 76.

	YOUNG. INCH.	IMMATURE. INCH.	IMMATURE. INCH.	ADULT. INCH.	
Length,	$\frac{1}{40}$	$\frac{1}{28}$	$\frac{1}{25}$	$\frac{1}{22}$	Greensand, Warmington.
Height,	$\frac{1}{75}$	$\frac{1}{50}$	$\frac{1}{45}$	$\frac{1}{40}$	Gault, Folkstone and Leacon Hill.
Thickness,		$\frac{1}{35}$		$\frac{1}{35}$	Chalk-marl, Dover.
					Detritus, Charing.
					Chalk, South-East England.

Chalk-marl, Bohemia (*Reuss*).

Carapace oblong. *Valves* obliquely convex, strongly raised at the posterior third of the ventral border, depressed towards the anterior and dorsal borders; surrounded by a marginal ridge, which is crenulated in the young shell, and becomes more and more rough with age, until in old specimens the valves are edged with coarse spines, strongest on the ventral border; this border increases in thickness posteriorly until it terminates abruptly opposite to the posterior hinge; it is strongly keeled, and is armed with six or seven stout spines, the terminal spine double, larger and more acute than the others, pointing obliquely downwards and outwards.

The surface of the valves of young individuals is coarsely punctated; in older

[1] See Taylor's Scient. Mem., vol. iv, art. 5.

shells the punctations are encroached upon by the intervening raised parts, which latter become more and more augmented, until the surface is roughly reticulated, and covered with granulations and spines, which are more or less obliquely arranged, especially on the posterior half. *Central tubercle* strongly developed; in old valves it is four-cleft. From the central tubercle of young shells an interrupted ridge runs backwards, which becomes gradually lost in old shells amidst the granulations of the surface. *Anterior extremity* obliquely rounded, shelving; *posterior* suddenly depressed into a short, flat, bearded lip, acute in young valves, and becoming more obtuse with age. *Dorsal* and *ventral borders* nearly straight. *Hinges* strongly developed.

Dorsal and *ventral aspects* vary according to age; in the young shell, owing to the comparatively greater prominence of the tubercle, and the less development of the ventral ridge, the profile is somewhat fiddle-shaped, but it gradually approaches with age to a sagittate form. Ventral aspect of each valve in young shells presents 3—4 longitudinal rows of punctations, which in the old shell are replaced by three rows of granulations. *Anterior aspect* triangular; at first lobed and contracted, ultimately forming an equilateral triangle.

This species is present in most of the members of the Chalk Formation, but is most abundant in the Gault. The Detritus affords the largest individuals. Dr. Reuss describes the immature form as *C. ciliata*, from the Bohemian Chalk-marl, and Mr. Williamson has noticed the adult form as occurring in the Detritus of Charing.

No. 7. Cythereis Lonsdaleiana, *nobis*. Tab. V, fig. 12 *a—c*.

	INCH.	
Length,	$\frac{1}{36}$	Chalk, Norwich.
Height,	$\frac{1}{65}$	
Thickness,	$\frac{1}{65}$	Upper Oolite, Dorset.

Carapace-valves oblong, rather depressed, especially on the dorsal half, smooth, rounded anteriorly. *Posterior extremity* rather contracted, obtuse, bearded. *Dorsal margin* nearly straight; *ventral* incurved at its anterior third. A thin, smooth semi-circular ridge lies near the anterior margin, and a similar slightly curved ridge runs along near the ventral border. On the dorsal border are situated 2—4 short, curved, crenulated ridges, lying obliquely, anteriorly pointing towards the median line of the valve, and posteriorly terminating on the dorsal edge. *Central tubercle* prominent. *Hinge-teeth* strongly developed.

This species is rare. It occurs in the Soft Chalk at Thorpe, near Norwich, and is present also in the White Limestone with flints of the Upper Oolite.

We have dedicated this interesting species to Mr. Lonsdale, who first pointed out the existence of Cythere in the Chalk of England.

No. 8. CYTHEREIS CORNUTA, *Rœmer*. Tab. V, fig. 13 *a—e*.

CYTHERINA CORNUTA, *Rœmer*. 1838. Jahrbuch f. Min. p. 518, n. 31, pl. vi, fig. 31.
— — *Reuss*. 1845. Verst. Böhm. Kreid. p. 105, n. 15, pl. xxiv, fig. 20.
CYPRIDINA SERRULATA, *Bosquet*. 1847. Ent. foss. Maestricht, pp. 20, 414, pl. iv, fig. 2 *a—d*.

	YOUNG. INCH.	ADULT. INCH.	
Length,	$\frac{1}{35}$	$\frac{1}{30}$	Gault, Folkstone.
Height,	$\frac{1}{80}$	$\frac{1}{63}$	Detritus, Charing.
Thickness,	$\frac{1}{80}$		Chalk, South-East England.

Tertiary Eocene, Paris (*Rœmer*).
Chalk-marl, Bohemia (*Reuss*).
Chalk, Maestricht (*Bosquet*).

Carapace somewhat oblong. *Valves* depressed towards dorsal border, provided with a strong, crenulated, marginal ridge, and bearing, when young, one or more irregular tubercles besides the central tubercle, which is long and pointed. *Anterior extremity* obliquely rounded, shelving, strongly bearded; *posterior* narrower, strongly depressed, acute, partially bearded.

Dorsal and *ventral aspects* of adult shell triangular; of the young shell somewhat sagittate, and its ventral surface longitudinally wrinkled. *Anterior aspect* irregularly triangular.

C. cornuta is not common. When young, it differs from the young form of *C. ciliata*, Reuss, in being quite destitute of punctations, in the greater development of its marginal ridge, in the different characters of its tubercles, in being wider anteriorly, and in having a more depressed carapace.

This species is described by M. Rœmer as occurring in the Tertiary beds near Paris, and by Dr. Reuss as being found in the Bohemian Chalk Formation. *C. serrulata*, Bosquet, of the Maestricht Chalk, does not appear to differ materially from *C. cornuta*, Rœmer.

No. 9. CYTHEREIS ALATA, *Bosquet*. Tab. V, fig. 14 *a—d*.

CYPRIDINA ALATA, *Bosquet*. 1847. Entom. foss. Maestricht, p. 19, n. 13, pl. iv, fig. 1 *a—d*.

	INCH.	
Length,	$\frac{1}{33}$	Detritus, Charing.
Height,	$\frac{1}{54}$	Chalk, Norwich, Gravesend, and Charlton.
Thickness,	$\frac{1}{43}$	

Chalk, Maestricht (*Bosquet*).

Carapace somewhat oblong. *Valves* smooth, shining, strongly convex on ventral half, depressed towards the dorsal border; a smooth, semicircular ridge lies near the anterior extremity, and is extended along the raised ventral keel. *Anterior extremity* rounded, shelving; *posterior* narrow, suddenly depressed, each extremity having strong

blunt spines on the ventral moiety. *Dorsal border* slightly elliptical; *ventral* straight, strongly keeled, acuminate posteriorly. *Central tubercle* nearly obsolete. *Hinges* strongly developed.

Dorsal and *ventral aspects* sagittate; *anterior* triangular.

This rare species, which differs from *C. cornuta*, Rœmer, chiefly in its want of a serrated border, is figured and described by M. Bosquet as occurring at Maestricht. We have met with it in the Charing Detritus, and in the Chalk of a few localities.

Sub-genus, *Bairdia*, M'Coy.

Cythere, *Münster*. 1830. Jahrbuch für Mineral. &c.
Cytherina, *Rœmer*. 1838. Jahrbuch für Mineral. &c.
— — 1840. Verstein. Norddeutsch. Kreideb.
Bairdia, *M'Coy*. 1844. Syn. Charact. Carb. Limest. Foss. Ireland.
Cytherina, *Reuss*. 1845. Verstein. Böhmisch. Kreidef.
— *Bosquet*. 1847. Mém. Soc. Royale Liège.

Sub-generic characters.—This section is very distinct from either of the foregoing, both as to its form of carapace and its method of hingement. The valves externally are convex and smooth, sometimes finely pitted or spined, never ribbed or granulated. The hinge is simple, no bar or teeth similar to those of *Cythere proper* being developed. *Bairdia* is characterised, as regards the carapace, by a somewhat similar formation of valves to that which obtains generally amongst the recent *Cyprides*, and partially in the *Candonæ*.

The valves frequently have more or less acute extremities, especially posteriorly; in shape, however, they vary from a triangular to an almost cylindrical form. The left valve is the largest,[1] and strongly overlaps the right valve on the dorsal and ventral borders; the smaller valve not fitting into a groove on the margin of the larger valve, but merely lying within it. The edges of the valves are thin and trenchant; they are bevilled off on the inside of the anterior, inferior, and posterior margins in the direction of the centres of the valves, and are provided with narrow, lamelliform plates, casing the inside of these margins. At the anterior and posterior extremities these plates frequently project so freely into the interior of the shell, that considerable cavities exist between them and the inner surface of the valves. The central third of the dorsal edge of the right (small) valve is straight and thin, finely but irregularly serrated, and somewhat sunk in or cut out from the rest of the edge. This straight portion of the dorsal margin is received in a slight depression under the curled dorsal edge of the larger valve.

[1] *B. Siliqua* is an exception to this rule.

No. 1. BAIRDIA SUBDELTOIDEA, *Münster*. Tab. V, fig. 15 *a—f'''*.

CYTHERE SUBDELTOIDEA, *Münster*. 1830. Jahrbuch f. Min. p. 61, n. 13.
CYTHERINA SUBDELTOIDEA, *Rœmer*, 1838. Jahrbuch f. Min. p. 517, n. 16, pl. vi, fig. 16.
— — — 1840. Verstein. Kreid. p. 105, n. 6, pl. xvi, fig. 22.
— — *Reuss*. 1845. Verstein. Böhm. Kreid. p. 16, n. 1, pl. v, fig. 38.
— TRIGONA, *Bosquet*. 1847. Ent. foss. Maestricht, p. 8, n. 3. pl. i, fig. 3 *a—e*.

	INCH.		
Length,	$\frac{1}{17}$	Greensand, Warminster.	Tertiary, North Germany (*Münster*).
Height,	$\frac{1}{32}$	Chalk-marl, Dover.	— France (*Münster*).
Thickness,	$\frac{1}{33}$	Detritus, Charing.	— Italy (*Münster*).
		Chalk, South-East England.	— Valparaiso (?), South America.

Chalk Formation, Bohemia (*Reuss*).
Chalk, Maestricht (*Münster* and *Bosquet*).
— North Germany (*Münster* and *Rœmer*).
— Weinböhla.
— Royan, South France.
Eocene, Hauteville, Normandy.
— Lower Fresh-water Formation, Isle of Wight.
Miocene, Virginia, North America.
Pliocene, Coralline Crag, Sutton[1] and Walton.

RECENT.

Australia, Sydney, finely punctate.
Bahama, Providence, finely punctate.
— — finely punctate and hairy.
— — smooth.
— Turk's Island, finely punctate.
Mauritius, finely punctate.
Manilla, finely punctate and hairy.[2]
North Britain, Arran, narrow variety, finely punctate.

Carapace triangular, resembling a thick orange-pip. *Valves* strongly convex, generally smooth, sometimes slightly-spined,[3] and shining; extremities sometimes spined. *Left* (large) *valve* protruding and somewhat angular on the dorsal, elliptical on the ventral margin; beaked posteriorly, obtuse anteriorly; *dorsal edge* inverted nearly the whole of its length; *ventral edge* inverted near the middle. In the *right valve*, which is narrower than the left, the projecting dorsal border is truncated, forming three sides of a hexagon; the ventral border is sinuous, shaped like that of the opposite valve, except that it is compressed at the centre, resembling a Scythian bow, arched at its anterior and posterior thirds, and incurved at the middle; strongly beaked posteriorly; subacute anteriorly. *Dorsal edge* slightly inverted at its

[1] In Mr. S. Wood's Collection.
[2] In Mr. Williamson's Collection.
[3] It is not improbable that the surface of the valves originally bore punctations, now defaced, as is the case with *Cytherella truncata*, the Chalk specimens of which are plain, whilst many of the better preserved specimens from the Gault exhibit pittings. The recent specimens are in general finely punctated; at Providence, however, there occur individuals without pittings, and at the same place specimens occur which are both hirsute and punctate, a condition probably frequent in living individuals: through Mr. Williamson's kindness in lending me his collection of recent Entomostraca for comparison, I have seen individuals from Manilla similarly characterised to the last mentioned, and specimens from Tenedos bearing marginal spines, traces of which condition exist in a few fossil individuals.

anterior and posterior thirds, forming a slight projection[1] at each extremity of the thin, straight hinge-margin; *ventral edge* inverted along its central third.

Dorsal aspect acute, oval; *anterior* oval.

In the recent specimens there is in the middle region of each valve an opacity occupying an irregular space, in the lower part of which, and below the centre of the valve, is situated a transparent rosette, formed by six or seven three-sided lucid spots, placed around a central round spot. These spots are externally pits, and internally faint eminences. Many of the fossil valves retain traces of the opacity and the lucid spots.

B. subdeltoidea differs from *B. curta* and *B. gracilis*, M'Coy,[2] judging from the figures and descriptions, by being, especially as regards the latter species, less acute anteriorly, much wider between the dorsal and ventral borders, and by its valves being much more gibbous.

M. Bosquet has referred to some points in which *C. trigona*, Bosquet, differs from M. Rœmer's figures of *C. subdeltoidea*;[3] but we cannot think that there is any essential dissimilarity between the two. M. Bosquet's figure 31*b*, intended for the right valve, is evidently the left valve in a reversed position. The right valve is strikingly distinct from its fellow valve, and from the figure alluded to.

This species is described by Münster as occurring in Tertiary strata at Osnabruck, Paris, Bordeaux, and Castellarquato, in the Middle strata of the Chalk Formation, near Dresden, Münster, and Lemförde, and in the Chalk at Maestricht. M. Rœmer found it in the Lower Chalk; Dr. Reuss found it common throughout the Chalk Formation of Bohemia, especially in the Lower Exogyra Sandstone, and particularly abundant in the "Pläner-schichten." According to M. Bosquet, it is rather common at Maestricht and the neighbourhood. Though abundant in the Chalk and Chalk-marl, and not rare in the Greensand, this species does not occur in the Gault. This is a common form in the Tertiary deposits, and it is very plentiful in the tropical seas; a narrow variety of this species exists in the Firth of Clyde.

We have not met with this species in any of the Oolites, but closely-allied forms occur in the Magnesian[4] and Carboniferous[5] Limestones of the British Isles, and in the Bituminous Limestone (Carboniferous) of South Australia.[6]

[1] Fig. 15 f' f'' f'''; *a* the anterior, and *b* the posterior projection.

[2] Syn. charact. pp. 64, 65, pl. xviii, figs. 6, 7.

[3] In the Jahrbuch, 1838, pl. vi, fig. 16, the right valve is figured, and the left valve in the Verst. Nordd. Kreid. pl. xvi, fig. 22.

[4] In the collection of Mr. King, Newcastle.

[5] In greyish Limestone, at Lawrieston and Stuartfield (East Kilbride), also in Limestone, near Newcastle-on-Tyne. History of Rutherglen and East Kilbride, by David Ure, A.M., 8vo, Glasgow, 1793, pp, 311, 312, pl. xiv, fig. 20. *Bairdia curta* and *B. gracilis*, M'Coy, before referred to, belong to the Carboniferous System of Ireland.

[6] Physical Description of New South Wales, by P. E. de Strzelecki, 8vo, London, 1845, p. 291, pl. xviii, fig. 10. *Bairdia affinis*, Morris.

No. 2. Bairdia Siliqua, *nobis*. Tab. V, fig. 16 *a*—*h*.

		Var. *α*.	Var. *β*.	
	INCH.	INCH.	INCH.	
Length,	$\frac{1}{12}$	$\frac{1}{20}$	$\frac{1}{19}$	Detritus, Charing.
Height,	$\frac{1}{30}$	$\frac{1}{30}$	$\frac{1}{60}$	Chalk, South-East England.
Thickness,	$\frac{1}{40}$	$\frac{1}{30}$	$\frac{1}{60}$	

Var. *α*. Detritus, Charing.
— Recent, Tenedos (hairy).[1]

Var. *β*. Detritus, Charing.
— Miocene, Bordeaux.
— Recent, Turk's Island, Bahama.

Carapace elongate, sub-triangular. *Valves* narrow, convex, sometimes spined, generally smooth, acuminate behind. *Dorsal margin* strongly arched, slanting off posteriorly; *ventral* nearly straight. *Anterior extremity* rounded; *posterior* acute. *Dorsal edge of right* (large) *valve* inverted near the middle; *ventral edge* inverted nearly its whole length.

Dorsal aspect narrow lanceolate; *anterior* acutely ovate.

Variety *α* (figs. 16 *e*, 16 *f*, 16 *g*), about two thirds the length and height of the foregoing, but comparatively more gibbous. *Dorsal margin* more prominent; *ventral* incurved.

Dorsal aspect elongated oval; *anterior* oval.

Variety *β* (fig. 16 *h*), about the length of Var. *α*, very narrow, strongly bent, incurved at the ventral, and arched at the dorsal border.

Dorsal aspect narrow lanceolate; *anterior* suborbicular.

We have met with *B. Siliqua* only in the Chalk and the Detritus. Perfect valves and carapaces of this elegant and fragile species are not easily obtainable from the Chalk. In the Detritus, however, perfect and united valves often occur. A hirsute individual of Variety *α* occurs at Tenedos.[1] Carapaces apparently identical with Var. *β* occur amongst the Fossil Entomostraca of Bordeaux, and recent in Turk's Island, Bahama. We may remark that *B. Siliqua* bears a striking resemblance to *Cyris fasciata*, Müller (Entomostraca, p. 53, n. 12, pl. iv, figs. 1-3), and to *Cypris ephippiata*, Koch (1837, Deutschl. Crustac., Heft 12, t. 1).

No. 3. Bairdia Harrisiana, *nobis*. Tab. VI, fig. 17 *a*—*f*.

	INCH.	INCH.	
Length,	$\frac{1}{28}$	$\frac{1}{19}$ [2]	Speeton Clay, Yorkshire.
Height,	$\frac{1}{60}$	$\frac{1}{43}$	Gault, Leacon Hill.
Thickness,	$\frac{1}{80}$		Detritus, Charing.
			Chalk, Gravesend and Charlton.

Carboniferous Limestone, East Kilbride.

Recent, Mouth of Thames.
— Manilla (hairy).[1]

Carapace elongate, arcuated, varying in the flexuosity of the ventral border.

[1] In Mr. Williamson's Collection.

[2] Specimens of this size are very rare.

Valves narrow, convex, smooth, occasionally punctate and spiny. *Anterior extremity* obliquely rounded; *posterior* subacute. *Left* (large) *valve* rather more elliptical on the back than the right valve, its *dorsal edge* very slightly inverted; the *middle of the ventral margin* inverted. *Hinge-margin of the right valve* finely crenulated, and traversed by a slight longitudinal furrow.

Dorsal aspect compressed oval; *anterior* oval.

This species is abundant in the Charing Detritus, and occurs sparingly in the Chalk, Gault, and Speeton Clay.[1] A very similar form occurs in a greyish stratum of Carboniferous Limestone at East Kilbride,[2] near Glasgow. This form also occurs recent at the mouth of the Thames; and a finely hirsute variety Mr. Williamson has obtained from the Philippines; all of which we are strongly disposed to consider identical (as far as the carapace can bear evidence) with the species above described.

This species is named in compliment to Mr. Harris of Charing, to whose long-continued exertions and researches (commenced in 1839) we are indebted for a large proportion of the series of Entomostraca at present under notice.

No. 4. BAIRDIA ANGUSTA, *Münster*. Tab. VI, fig. 18, *a—f'*.

CYTHERE ANGUSTA, *Münster*. 1830. Jahrbuch f. Min. p. 63, n. 10.
CYTHERINA LÆVIGATA, *Rœmer*. 1840. Verstein. Kreid. p. 105, n. 5, pl. 16, fig. 20.
— ATTENUATA, *Reuss*. 1845. Verstein. Böhm. Kreid. p. 104, n. 8, pl. xxiv, fig. 15 *a, b*.

	INCH.		
Length,	$\frac{1}{32}$	Gault, Folkstone.	Tertiary, Osnabrück (*Münster*).
Height,	$\frac{1}{50}$	Detritus, Charing.	— Paris (*Münster*).
Thickness,	$\frac{1}{80}$	Chalk, Gravesend.	— Bordeaux (*Münster*).
			— Castellarquato (*Münster*).
			— Coralline Crag, Sutton.[3]

Chalk, North Germany (*Rœmer*).
— Weinböhla, Saxony.
Chalk-marl, Bohemia (*Reuss*).

Recent, Adriatic (*Münster*).
— Arran, North Britain.
— Mouth of Thames.

Carapace subovate, mytiloid, variable in height and thickness. *Valves* narrow, convex, smooth and glistening; elliptical on the dorsal edge, more or less incurved on the ventral border. *Anterior extremity* somewhat depressed, rounded; *posterior* narrow, gibbous, acute. The *hinge-margin of the left valve* is occupied by two smooth bars, placed end to end, forming two arcs to the elliptical margin, and meeting at its

[1] This is the only species we have been enabled to obtain from the Speeton Clay. Our examination of this deposit has not been extensive; the Microzoa, however, that it afforded, especially the Foraminifera, were identical with those of the Gault.

[2] Among some fossil microscopic shells, presented by Dr. Ure, of East Kilbride, to the Hunterian Museum, Royal Coll. Surg. London, and referred to in his 'History of Rutherglen,' &c., p. 312, are some fine specimens of a species apparently identical with *B. Harrisiana*.

[3] In Mr. S. Wood's Collection.

centre; a slight furrow lies between each of the little ridges and the outer margin (fig. 18 *f'*). The *right valve* is provided with a strong ventral lamina (fig. 18 *e'*).

Dorsal aspect elongate oval; *anterior* varying from ovate to oval.

Münster's description of *C. angusta* is quite applicable to this species, and Rœmer's *C. lævigata* is not materially different. Münster found this species living in the Adriatic, and we have specimens from the British seas. The specimens from the Chalk and Gault have generally a much narrower form than those from the Detritus, which latter, like the recent and some of the Gault specimens, are broader and more convex: when very thick, this species approaches the form of *C. aurantia*, Baird. *C. amygdalina*, M'Coy (Syn. Charact. &c. pl. xxiii, fig. 8), does not appear to differ essentially from this species.

No. 5. BAIRDIA TRIQUETRA, *nobis*. Tab. VI, fig. 19 *a—c*.

	INCH.	
Length,	$\frac{1}{35}$	Greensand, Blackdown.
Height,	$\frac{1}{65}$	Chalk, Gravesend.
Thickness,	$\frac{1}{63}$	

Carapace-valve (left) triangular, convex, smooth. *Dorsal margin* strongly arched: *ventral* straight. *Anterior extremity* rounded; *posterior* subacute, rather narrower than the anterior. Seen in profile, the posterior extremity of the valve is more obtuse than the anterior.

This species, which slightly resembles *C. arcuata*, Münster (Jahrb. 1838, pl. vi, fig. 17), is more triangular than *B. angusta*; the latter is higher at the anterior and posterior thirds, also thicker posteriorly, and less convex centrally, than *B. triquetra*.

In the Chalk of Gravesend we have found two separate valves only of this species, and one valve in the Greensand of Blackdown.

No. 6. BAIRDIA SILICULA, *nobis*. Tab. VI, fig. 20 *a—c*.

	INCH.	
Length,	$\frac{1}{30}$	
Height,	$\frac{1}{37}$	Detritus, Charing.
Thickness,	$\frac{1}{63}$	

Carapace-valve (left) somewhat oblong, convex, smooth. *Anterior extremity* semicircular; *posterior* oblique, subacute at its inferior angle. *Dorsal border* somewhat arched; *ventral* straight, inverted at its middle.

Dorsal aspect of the closed carapace elongate oval; *anterior* oval.

We have met with this single valve only of *B. Silicula*.

Sub-genus *Cytherella*, nobis.

CYTHERE, *Münster*. 1830. Jahrbuch f. Min.
CYTHERINA, *Lyell* and *Lonsdale*. 1838. Elements of Geology.
— *Rœmer*. 1838. Jahrbuch f. Min.
— — 1840. Verstein. Norddeutsch. Kreid.
— *Reuss*. 1845. Verstein. Böhm. Kreid.
CYTHERE, *Cornuel*. 1846. Mém. Soc. Géol. France.
CYTHERINA, *Williamson*. 1847. Transact. Manchest.
— and CYPRIDINA, *Bosquet*. 1847. Mém. Soc. Roy. Liège,

Sub-generic characters.—In this peculiarly distinct group the carapace-valves are oblong, and vary in the convexity and smoothness of the surface. The right valve is larger than the left, and its contact-margin thicker than that of the opposite valve. A groove, excavated along the inner edge of the contact-margin of the right valve, receives a narrow trenchant ridge or flange, which runs along the inner edge of the contact margin of the left valve. The outer edge of the groove of the anterior margin is itself sometimes produced into a slight ridge, which in the closed carapace lies outside the flange of the opposite valve. The outer part of the contact-margin of the left valve lies against, but does not wholly cover, especially on the posterior and dorsal borders, the salient outer half of the contact-margin of the right valve; the margin of the larger valve *projecting beyond*, but *not overlapping*, the smaller valve. The substance of the shell of *Cytherella* is somewhat greater in the posterior than in the anterior parts of both valves, the thickness gradually increasing from before backwards; so that in the large valve the groove on the anterior margin is slight, and accompanied by a narrow outer boundary, whilst posteriorly the salient part of the contact-margin is broader than the groove. From the same cause the flange of the lesser valve occupies nearly the whole thickness of the anterior margin, although at this part it is thin and low; whilst it gradually increases in size towards the posterior extremity, where it is strongly marked, and where the accompanying boundary of contact-margin is as broad as the base of the ridge. The valves of *Cytherella* (as previously mentioned) exhibit a small round tubercle on their inner surface between the centre and the dorsal margin, which is faintly marked in the young shell, and increases in size with the age of the individual.

No. 1. CYTHERELLA OVATA, *Rœmer*. Tab. VII, fig. 24 *a*—*i*.

CYTHERINA, *Lyell* and *Lonsdale*. 1838. Elem. Geolog. p. 55, (woodcut) fig. 19.
— OVATA, *Rœmer*. 1840. Verstein. Kreid. p. 104, n. 4, pl. xvi, fig. 21.
— — *Reuss*. 1845. Verstein. Böhm. Kreid., p. 16, n. 6, pl. v, fig. 35.
CYTHERE AMYGDALOIDES, VAR. BREVIS, *Cornuel*. 1846. Mém. Soc. Géol. de France, sér. sec., tom. i, part. 2, p. 199, pl. viii, fig. 12.
CYTHERINA RENIFORMIS, *Bosquet*. 1847. Ent. foss. Maestricht, p. 6, n. 1, pl. i, fig. 1 *a*—*f*.
— LÆVIS, *Williamson*. 1847. Trans. Manchest. Phil. Soc. 1847, pl. iv, fig. 80.

	YOUNG. INCH.	ADULT. INCH.
Length,	$\frac{1}{50}$	$\frac{1}{25}$
Height,	$\frac{1}{66}$	$\frac{1}{34}$
Thickness,		$\frac{1}{45}$

Greensand, Warminster.
Gault, Folkstone and Leacon Hill.
Chalk-marl, Dover.
Detritus, Charing.
Red Chalk, Flamborough.
Chalk, South-East England.

Inferior Greensand, France (*Cornuel*).
Lower Chalk, North Germany (*Rœmer*).
Chalk, Bohemia (*Reuss*).
— Maestricht (*Bosquet*).
— Weinböhla, Saxony.
— Royan, South France.

Eocene Tertiary, Bracklesham.

Carapace oblong ovate, generally smooth and shining; spines apparent in some young shells. Individuals vary in shape according to age; the young shell is ovate, higher on the anterior than the posterior half. The centre of the dorsal margin becomes more and more acutely protruded the older the individual grows, and the ventral margin becomes more or less incurved, giving to some specimens a kidney-shaped form. Occasionally adult specimens of a narrow or elongate oval shape occur (fig. 24 *h*), the dorsal margin being but slightly arched. The *valves* convex; the convexity slight in young individuals, and increasing with age; somewhat rounded at each extremity. *Dorsal margin of right* (large) *valve* elliptical; *ventral* nearly straight, variable. The *left valve* narrower than the *right*, less arched on the dorsal border, slanting off suddenly at the upper half of the posterior extremity, incurved at the middle of the ventral border, bean-shaped, and readily distinguishable from its fellow-valve.[1]

Dorsal aspect narrow obovate; *anterior* oval.

In this species the groove and flange of the contact-margins are strongly developed; so also is the internal tubercle lying between the centre of the valve and the dorsal margin.

C. ovata is one of the most abundant species of Entomostraca in the Cretaceous system; it is most plentiful in the Chalk and Chalk-marl, and we have found it in all

[1] With respect to this and the following species, we differ from M. Bosquet as to which is the dextral and which the sinistral valve, and, consequently, as to which is the anterior and which the posterior extremity of the shell. M. Bosquet appears to have been led to regard the obtuse extremity as the anterior, contrary to what obtains generally among the Ostracoda, by the relative size of the valves being the reverse of that of the valves of Cythere in general. This exceptional condition is constant in Cytherella, but is unaccompanied by any other deviation from the typical characters of Cythere sufficient to warrant us in supposing that the analogy between Cytherella and the other groups is broken in any other respect than in the relative size of the valves.

the Cretaceous deposits, except Speeton Clay; it occurs also in a Tertiary Blue Clay at Bracklesham.

The young form of this species is described by M. Rœmer, as occurring in the Lower Chalk-marl[1] at Lemförde.

C. reniformis, Bosquet, is apparently a kidney-shaped variety of this species; and it is very probable that the var. *brevis* of *Cythere amygdaloides*, Cornuel, is also identical with *C. ovata*.

No. 2. CYTHERELLA TRUNCATA, *Bosquet*. Tab VII, fig. 25 *a—e*.

CYTHERINA TRUNCATA, *Bosquet*. Ent. foss. Maestricht, p. 7, n. 2, pl. i, fig. 2 *a—c*.

	YOUNG. INCH.	ADULT. INCH.		
Length,	$\frac{1}{40}$	$\frac{1}{28}$	Gault, Folkstone and Leacon Hill.	Tertiary, Eocene, Alabama, North America.
Height,	$\frac{1}{75}$	$\frac{1}{50}$	Chalk-marl, Dover.	— — Barton, Hants.
Thickness,		$\frac{1}{75}$	Detritus, Charing.	— — Colwell Bay, Isle of Wight.
			Chalk, South-East England.	— Miocene, Bordeaux.

Chalk, Maestricht (*Bosquet*).
— Balsberg, Sweden.

Carapace oblong, closely resembling in shape the seed of the sunflower; retaining the same form through all stages of growth; occasionally constricted across the median third of the valves, and subject to slight variation in the curvature of the dorsal and ventral borders. *Valves* convex on the posterior half, depressed anteriorly, smooth and shining; faintly pitted, the punctations arranged in seven to eight longitudinal lines.[2] *Dorsal and ventral borders* nearly straight. *Anterior and posterior extremities* somewhat rounded, the latter sometimes oblique at its superior moiety. The dorsal border of the right (larger) valve is more arched than that of the left, and the ventral border of the left (smaller) valve rather more incurved than that of the right.

Dorsal aspect wedge-shaped; *anterior* compressed oval.

This differs from the preceding species by the carapace being smaller, narrower, and straighter; by its being more strongly depressed anteriorly, and more decidedly truncated posteriorly.

The Maestricht form figured and described by M. Bosquet is more arcuated than the generality of individuals from the other Cretaceous deposits. This species is of much rarer occurrence in the Cretaceous Formation than *C. ovata*. The Tertiary specimens are by no means rare, they vary considerably with regard to the punctations; when the pittings are coarse, the specimens approach very nearly to *C. aciculata*, Rœmer (Jahrbuch, 1838, p. 517, n. 21, pl. vi, fig. 21).

[1] This "lower white (sandy) chalk-marl" is the lowermost bed of the chalk without flints, and superincumbent on the grey chalk-marl.—See Taylor's Scient. Mem. loc. cit.

[2] This character is well shown in some of the best preserved of the Gault specimens.

No. 3. Cytherella Williamsoniana, *nobis*. Tab. VII, fig. 26, *a*—*i*.

	Young. Inch.	Adult. Inch.	Var. *Granulosa*. Inch.	
Length,	$\frac{1}{63}$	$\frac{1}{33}$	$\frac{1}{29}$	Gault, Folkstone, and Leacon Hill.
Height,	$\frac{1}{100}$	$\frac{1}{60}$	$\frac{1}{50}$	Chalk-marl, Dover.
Thickness,		$\frac{1}{92}$		Detritus, Charing.
				Chalk, South-East England.

Carapace depressed, oblong; when young, approaching to oval. *Valves* flat, with a very shallow internal cavity; having a smooth, convex ridge running close to the anterior margin, and dying out on the superior and inferior margins; a similar but stronger ridge lies near the superior, inferior, and posterior borders of the valve, or rather, two strongly-developed longitudinal ridges, one near the superior, and the other near the inferior border, beginning on the anterior third of the valve, free of the marginal ridge, and within it, run backwards to the posterior extremity of the valve, and are there more or less perfectly connected by a cross ridge. Between the anterior extremities of these ridges there are sometimes one or more short ridges or club-shaped tubercles. In old shells, at the superior and inferior angles of the posterior extremity of the valve, the ridge is developed into two large tubercles, having corresponding cavities on the inner surface of the valve. *Extremities* rounded; *posterior extremity* slightly bearded. *Dorsal edge* slightly arched; *ventral* somewhat incurved.

Dorsal and ventral aspects narrow, irregular, elongate-oblong; *anterior* irregular, oblong.

Named after Mr. Williamson, of Manchester, who has devoted much time and labour to the investigation of the Entomostraca and other Microzoa, both recent and fossil.

Variety *Granulosa*, fig. 26 *i*.

Chalk, Norwich.

In this shell, which arrives at a comparatively large size, the ridges and tubercles, especially the latter, are very strongly developed. The whole surface of the valve is covered with granulations, coarser in the depressions than on the ridges. It occurs rather plentifully in the Soft Chalk at Thorpe, near Norwich, and like others of the Entomostraca of that locality has a reddish-brown colour.

This depressed form of carapace is not very common. Besides the above-mentioned species and its variety, there is one other species in the Maestricht Chalk, described and figured by M. Bosquet as *Cypridina auricularis* (Op. cit. pl. iii, fig. 3), and another in the Carboniferous Limestone of East Kilbride,[1] Scotland.

[1] In the Hunterian Museum, among the fossil microscopic shells from East Kilbride. See note, p. 26.

No. 4. Cytherella (?) appendiculata, *nobis*. Tab. VI, fig. 21 *a*, *b*.

	INCH.	
Length,	$\frac{1}{30}$	
Height,	$\frac{1}{75}$	Gault, Folkstone.
Thickness,	$\frac{1}{120}$	

Carapace-valve (right) somewhat oblong; irregularly gibbous; nearly straight above, incurved below. *Anteriorly* flattened, and obliquely rounded; *posteriorly* tapering and produced into an obtuse point; *both extremities* furnished with a slight marginal ridge; central region of the valve bearing two curved, convex ridges, formed by the irregularity of the surface; each ridge beginning rather in front, and on either side, of the centre of the valve, with a roundish boss, running backwards, and curving one up and the other down, so as to leave an oval depressed space between them, and almost meeting near the posterior extremity.

The closed valves would present a profile somewhat fiddle-shaped.

We have met with a single valve only of this species, and that unfortunately has been since broken.

No. 5. Cytherella (?) Mantelliana, *nobis*. Tab. VI, fig. 22 *a*—*c*.

	INCH.	
Length,	$\frac{1}{50}$	
Height,	$\frac{1}{75}$	Detritus, Charing.
Thickness,	$\frac{1}{130}$	

Carapace somewhat oblong, depressed. *The surface of the valves* marked with about twenty longitudinal rows of punctations. *Anterior extremity* rounded; *posterior* obliquely rounded. *Dorsal edge* straight; *ventral* incurved. A slight depressed margin or lip, running round the edge of each valve, forms in the closed carapace a little ridge or keel at the junction of the contact-margins of the valves.

Dorsal aspect narrow acute oval; *anterior* compressed oval.

One closed carapace from the Charing Detritus is the only example we have yet seen of this species.

This species is named in compliment to Dr. Mantell, whose geological researches, especially in the Cretaceous Formation and its Microzoa, are universally known and appreciated.

No. 6. CYTHERELLA (?) BOSQUETIANA, *nobis.* Tab. VI, fig. 23 *a—c.*

	INCH.	
Length,	$\frac{1}{39}$	
Height,	$\frac{1}{75}$	Detritus, Charing.
Thickness,	$\frac{1}{130}$	

Carapace nearly oblong, somewhat arcuated, slightly convex; rounded anteriorly almost squared posteriorly. *Surface of valves* roughened and finely granulated.

Dorsal aspect narrow acute oval; *anterior* ovate.

C. Bosquetiana differs from *C. truncata* in being arcuated and roughened, and especially in being convex centrally instead of posteriorly.

We have met with only one specimen, a closed carapace, of this species, which is named in honour of M. Bosquet, author of the elaborate and elegant memoir on the Entomostraca of the Maestricht Chalk.

SYNOPTICAL TABLE.

No.	Species.	English Cretaceous.							Foreign Cretaceous.											Tertiary.			Recent.	Infra-Cretaceous.			TABLE SHOWING THE PER CENTAGE OF THE SPECIES IN THE CHALK, DETRITUS, AND GAULT.		
									Chalk.				North Germany.		Bohemia.		France.	North Germany.											
		Chalk.	Red Chalk.	Charing Detritus.	Chalk-marl.	Gault.	Greensand.	Specton Clay.	Maestricht.	Royan.	Balsberg.	Weinböhla.	Upper Chalk.	Lower Chalk.	Chalk.	Chalk-marl.	Inf. Greensand.	Hils-clay.	Eocene.	Miocene.	Pliocene.		Upper Oolite.	Carboniferous Limestone.	Chalk.	Charing Detritus.	Gault.
1	Cythere Hilseana	−	−	+	+	+	+	−	−	−	+	−	−	−	+	+	−	+	+	+					—	6·	14·5
2	C. punctatula	+	−	+	+	+	+	−	+	−	−	−	−	−	+	+	+								1·8	1·5	2·
3	C. umbonata	+	−	+	+																				2·5	1·5	—
4	C. Faba	−	−	+	−	−	−	−	−	−	−	−	−	−	−	+									—	·1	—
5	C. Bairdiana	−	−	−	−	−	+																		—	—	—
6	Cythereis interrupta	+	−	+	−	+	+	−	+	−	−	−	−	−	−	−	−	−	−	−	−	−	+		·75	·5	5·
7	C. Gaultina	−	−	−	−	+																			—	—	·5
8	C. macrophthalma	+	−	−	−	−	−	−	+																·35	—	—
9	C. triplicata	+	−	+	−	+	−	−	−	−	−	−	−	−	−	−	−	+							·75	2·	2·
10	C. quadrilatera	+	−	+	−	+	−	−	−	−	−	+	+	−	+	+	+	−	−	−	−	−	+		2·	7·5	41·5
11	C. Lonsdaleiana	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+		4·	—	·1
12	C. cornuta	+	−	+	−	+	−	−	+	−	−	−	−	−	−	+	−	−	+						—	2·5	—
13	C. ciliata	+	−	+	+	+	−	−	−	−	−	−	−	−	−	+									3·	13·	20·5
14	C. alata	+	−	+	−	−	−	−	+																1·5	·1	—
15	Bairdia subdeltoidea	+	−	+	+	−	+	−	+	+	−	+	−	+	+	+	−	−	+	+	+	+	−	+	27·	21·	—
16	B. Siliqua	+	−	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	+			4·	1·5	—
17	B. Harrisiana	+	−	+	−	−	−	+	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	+	·75	5·5	—
18	B. angusta	+	−	+	−	+	−	−	−	−	−	+	+	−	−	+	−	−	+	+	+	+	−	+	·1	·1	1·5
19	B. triquetra	+	−	−	−	−	+																		·35	—	—
20	B. Silicula	−	−	+																					—	·1	—
21	Cytherella ovata	+	+	+	+	+	+	−	+	+	−	+	−	+	+	−	+	−	+						38·5	26·	8·
22	C. truncata	+	−	+	+	+	−	−	+	−	+	−	−	−	−	−	−	−	+	+					3·	7·	2·
23	C. Williamsoniana	+	−	+	+	+																			9·5	3·5	2·
24	C. appendiculata	−	−	−	−	+																			—	—	·1
25	C. Mantelliana	−	−	+																					—	·1	—
26	C. Bosquetiana	−	−	+																					·1	·1	—

APPENDIX.

The names of the authors who have treated of the Cretaceous Entomostraca are given at pages 2 and 3 of this Memoir, and a few remarks are made on the nomenclature and arrangement adopted by some of them. But a fuller account of the species of Entomostraca found in the Cretaceous formations, British and foreign, will probably be not altogether unacceptable. We subjoin, therefore, a corrected list of the species already figured and described.

Münster, Jahrbuch f. Miner., &c., 1830, p. 64.

Cythere subdeltoidea = Bairdia
— compressa =(?) Cytherella } (not figured.)

Römer, Verstein. Norddeutsch. Kreidebirg., 1840, p. 104, Tab. xvi, figs. 16—21.

Cytherina	Hilseana	= Cythere.
—	punctatula	= Cythere.
—	triplicata	= Cythereis.
—	ovata	= Cytherella.
—	lævigata	= Bairdia angusta (*Münster.*)
—	subdeltoidea (*Münster*)	= Bairdia.
—	quadrilatera	= Cythereis.

Reuss, Verstein. Böhm. Kreideform., 1845, pp. 16, 104, Tab. v, figs. 33—39, Tab. xxiv. figs. 12—22.

"Simplices"	Cytherina	parallella	= (?) Cytherella.
	—	complanata	= (?) Cytherella.
	—	ovata (*Rœmer*)	= Cytherella.
	—	elongata	= (?) Cytherella.
	—	asperula	= (?) Cytherella.
	—	subdeltoidea (*Münster*)	= Bairdia.
	—	Hilseana (*Rœmer*)	= Cythere.
	—	Faba	= Cythere.
	—	solenoides	= (?) Cytherella.
	—	attenuata	= (?) Bairdia angusta (*Münster.*)
"Marginatæ"	—	semiplicata	= Cythereis.
	—	ciliata	= Cythereis.
	—	ornatissima	= Cythereis.
	—	ornatissima, bis	= Cythereis quadrilatera (*Rœm.*)
	—	Karsteni	= Cythereis.
"Cornutæ"	—	cornuta (*Rœm.*)	= Cythereis.
	—	spinosa	= Cythereis.
"Concentricæ"	—	concentrica	= Cythere punctatula (*Rœm.*)

Cornuel, Mém. Soc. Géol. France, sec. sér. tom. i, sec. part., 1846, pp. 196 et seq., Pl. viii, figs. 1—23.

Cythere amygdaloides.
— var. cylindracea.
— — pyriformis.
— — arcuata.
— — brevis = (?) Cytherella ovata (*Rœm.*)
— Harpa = Cythereis quadrilatera (*Rœm.*)
— auriculata = Cythereis triplicata (*Rœm.*)
— semimarginata = Cythereis (?) triplicata (*Rœm.*)
— var. rugosa.
— — simplex = Cythereis.
— sculpta = Cythere punctatula (*Rœm.*)

Bosquet, Entom. foss. Maestricht, 1847.

Cytherina reniformis = Cytherella ovata, var. (*Rœm.*)
— truncata = Cytherella.
— trigona = Bairdia subdeltoidea (*Münster.*)
Cypridina fusiformis = Cythereis.
— Favrodiana = Cythereis.
— interrupta = Cythereis.
— Rœmeriana = Cythere punctatula (*Rœm.*)
— furcifera = Cythereis.
— Forsteriana = Cythereis.
— pulchella = Cythereis.
— elegans = Cythereis.
— auricularis = Cytherella.
— macrophthalma = Cythereis.
— hieroglyphica = Cythereis.
— Koninckiana = Cythereis.
— alata = Cythereis.
— serrulata = Cythereis cornuta (*Rœm.*)
— ornata = Cythereis.
Cyprella ovulata = Cypridina.
— Koninckiana = Cypridina.

Williamson, On the Mud of the Levant, &c., from Mem. Manchest. Lit. Phil. Soc., vol. viii, 1847, pp. 74 et seq.; Index, pp. v, vi; figs. 75—80.

Cytherina echinulata = Cythereis ciliata (*Reuss.*)
— concentrica = Cythere punctatula (*Rœm.*)
— umbonata = Cythere.
— serrata = (?) Cytherella.
— lævis = Cytherella ovata (*Rœm.*)

Cornuel, Mém. Soc. Géol. France, sec. sér., tome iii, 1848, pp. 242 et seq. pl. iii figs. 1—15.

Cythere amygdaloides, var. lata.
— — var. punctatula.
— acuta = (?) Bairdia.
— — var. recta.
— auriculata, var. simplex = Cythereis.
— inversa.
— — var. imitans.

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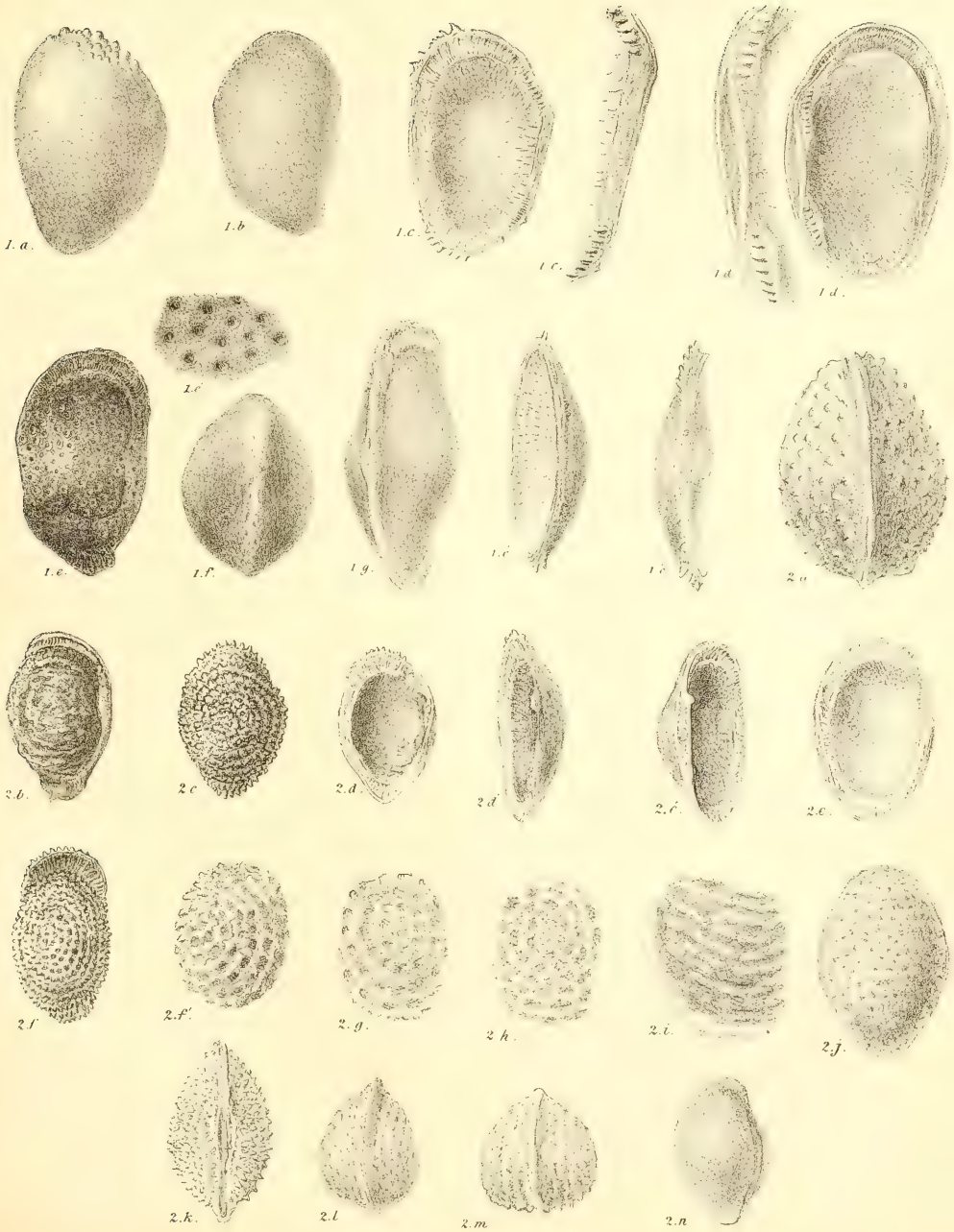
TAB. I.

Fig. 1. *Cythere Hilseana.*

a × 50	Left valve, outside	Detritus.	Charing.
b × 50	Right valve, outside	,,	,,
c × 50	Right valve, inside	Gault.	Folkstone.
c′ ×100	Right valve, hinge	,,	,,
c″ × 50	Right valve, dorsal edge	,,	,,
c‴ × 50	Right valve, ventral edge	,,	,,
d × 50	Left valve, inside	,,	,,
d′ ×100	Left valve, hinge	,,	,,
e × 50	Right valve, outside	,,	,,
e′ ×100	Punctations (of fig. 1 *e*)	,,	,,
f × 50	Perfect carapace, anterior aspect	Detritus.	Charing.
g × 50	Perfect carapace, dorsal aspect, seen obliquely	,,	,,

Fig. 2. *Cythere punctatula.*

a × 50	Old, perfect, dorsal aspect	Greensand.	Warminster.
b × 50	Old, left valve, outside	Gault.	Folkstone.
c × 50	Immature, right valve, outside	,,	,,
d × 50	Immature, right valve, inside	,,	,,
d′ × 50	Immature, right valve, dorsal edge	,,	,,
e × 50	Old, left valve, inside	,,	,,
e′ × 50	Old, left valve, dorsal edge	,,	,,
f × 50	Young, right valve, outside	,,	Leacon Hill.
f′ ×100	Young, central surface (of fig. 2 *f*)	,,	,,
g ×100	Immature, central surface	,,	Folkstone.
h ×100	Immature, central surface	,,	,,
i ×100	Old, central surface	Detritus.	Charing.
j × 50	Worn, perfect, left valve upwards	Greensand.	Warminster.
k × 50	Immature, perfect, dorsal aspect	Gault.	Folkstone.
l × 50	Old, perfect, ventral aspect	Detritus.	Charing.
m × 50	Old, perfect, anterior aspect	Gault.	Folkstone.
n × 50	Var. *virginea*, perfect carapace, placed obliquely, right valve upwards	Chalk.	Gravesend.


1. a.
1. b
1. c.
1. c.
1. d.
1. d.
1. e.
1. e
1. f.
1. g.
1. i
1. i
2. a
2. b.
2. c
2. d.
2. d
2. e.
2. e.
2. f
2. f.
2. g.
2. h.
2. i.
2. j.
2. k.
2. l
2. m.
2. n

TAB. II.

Fig. 3. *Cythere umbonata.*

a × 50	Perfect, dorsal aspect	Detritus.	Charing.
b × 50	Perfect, ventral aspect	,,	,,
c × 50	Young, perfect, ventral aspect	,,	,,
d × 50	Perfect, posterior aspect	,,	,,
e × 50	Perfect, placed obliquely, left valve upwards	,,	,,
e′ × 100	Punctations (of fig. 3 *e*)	,,	,,
f × 50	Right valve, outside	,,	,,
g × 50	Left valve, inside	,,	,,

Fig. 4. *Cythere Faba.*

a × 50	Perfect, right valve upwards	Detritus.	Charing.
b × 50	Perfect, dorsal aspect	,,	,,
c × 50	Perfect, anterior aspect	,,	,,

Fig. 5. *Cythere Bairdiana.*

a × 50	Right valve, inside	Greensand.	Farringdon.
b × 50	Right valve, dorsal edge	,,	,,
c × 50	Right valve, anterior aspect	,,	,,

Fig. 6. *Cythereis interrupta.*

a × 50	Left valve, outside	Detritus.	Charing.
c × 50	Perfect, dorsal aspect	,,	,,
h × 100	Punctations	,,	,,
b × 50	Var. *α*, left valve, outside	Gault.	Leacon Hill.
f × 50	Var. *α*, perfect, ventral aspect	,,	,,
e × 50	Var. *β*, left valve, outside	,,	Folkstone.
d × 50	Var. *β*, right valve. inside	,,	,,
g × 50	Var. *β*, perfect, anterior aspect	,,	,,

Fig. 7. *Cythereis Galtina.*

a × 50	Right valve, outside	Gault.	Folkstone.
b × 50	Left valve, inside	,,	,,
c × 50	Left valve, dorsal edge	,,	,,

Fig. 8. *Cythereis macrophthalma.*

a × 50	Left valve, outside	Chalk.	Norwich.
a′ × 50	Left valve, inside	,,	,,
a″ × 50	Left valve, dorsal edge	,,	,,
b × 50	Right valve, outside	,,	,,
b′ × 50	Right valve, inside	,,	,,
b″ × 50	Right valve, dorsal edge	,,	,,
b‴ × 50	Right valve, anterior edge	,,	,,

3 a

3 b

3.c.

3 c

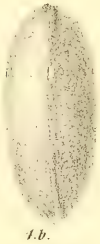
3.d

3.e.

3.f

3.g

4 a.


4.b.

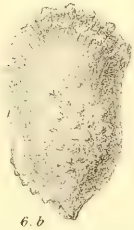
4.c.

5.a.

5.b.

5.c.

6 a


6.b

6.c.

6 d.

6 e

6.f.

6.h.

6.g.

7 a.

7.b.

7 c

8 a.

8 a.

8.b.

8.b.

8 a

8 b'

8.b''

TAB. III.

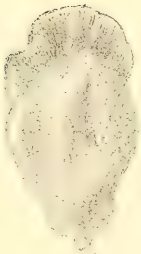
Fig 9. *Cythereis triplicata.*

a × 50	Left valve, outside	Detritus.	Charing.
b × 50	Right valve, outside	,,	,,
c × 50	Right valve, inside	,,	,,
c′ × 50	Right valve, dorsal edge	,,	,,
d × 50	Left valve, inside	,,	,,
d′ × 50	Left valve, dorsal edge	,,	,,
e × 50	Perfect, dorsal aspect	Gault.	Folkstone.
f × 50	Perfect, ventral aspect	,,	,,
g × 50	Perfect, anterior aspect	,,	,,
h × 100	Punctations	,,	Leacon Hill.

Fig. 10. *Cythereis quadrilatera.*

a × 50	Adult, left valve, outside	Gault.	Folkstone.
b × 50	Adult, right valve, outside	,,	,,
c × 50	Adult, right valve, inside	,,	,,
c′ × 50	Adult, right valve, dorsal edge	,,	,,
d × 50	Adult, left valve, inside	,,	,,
d′ × 50	Adult, left valve, dorsal edge	,,	,,
e × 50	Adult, perfect, dorsal aspect	,,	,,
f × 50	Adult, perfect, ventral aspect	,,	,,

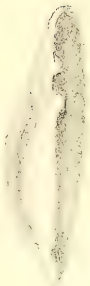
9.a.



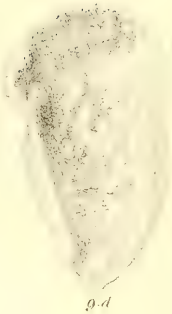
9.b.

9.c.

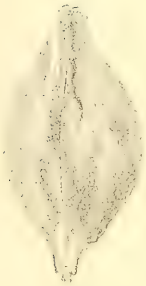
9.c'.



9.d'



9.d

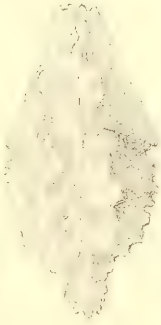


9.e.

9.f.

9.h.

9.g.



10.e.

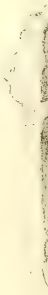
10.f.

10.a.

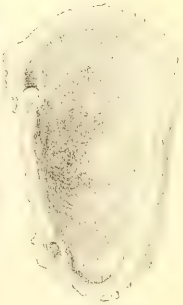
10.b

10.c.

10.c



10.d.



10.d.

Lovén Sculpsit.

TAB. IV.

Fig. 10. *Cythereis quadrilatera*, continued.

g × 50	Adult, perfect, anterior aspect . .	Gault.	Folkstone.
h × 50	Immature, left valve, outside . .	,,	,,
i × 50	Immature, left valve, outside . .	,,	,,
i′ × 50	Immature, perfect, dorsal aspect . .	,,	,,
j × 50	Young, right valve, outside . .	,,	,,
j′ × 50	Young, perfect, dorsal aspect . .	Detritus.	Charing.

Fig. 11. *Cythereis ciliata.*

a × 50	Adult, left valve, outside . . .	Detritus.	Charing.
b × 50	Adult, perfect, placed obliquely, left valve upwards . . .	,,	,,
c × 50	Adult, perfect, dorsal aspect . .	,,	,,
d × 50	Adult, perfect, ventral aspect . .	,,	,,
e × 50	Adult, perfect, anterior aspect .	,,	,,
f × 50	Immature, left valve, outside . .	Gault.	Folkstone.
g × 50	Young, left valve, outside . . .	,,	,,
g′ × 50	Young, perfect, dorsal aspect . .	,,	,,
h × 50	Young, left valve, outside . . .	,,	,,
h′ × 50	Young, perfect, dorsal aspect . .	Detritus.	Charing.

10.g.

10.h.

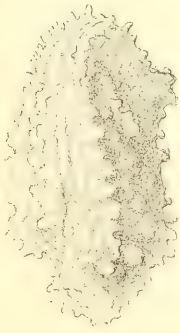
10.i

10.i'

10.j

10.j'

11.a



11.b

11.c

11.d.

11.e.

11.f.

11.g.

11.g'

11.h

11.h'

J.W.L. mund. del. et lith.

TAB. V.

Fig. 12. *Cythereis Lonsdaleiana.*

a × 50	Left valve, outside	Chalk.	Norwich.
b × 50	Right valve, outside	,,	,,
c × 50	Right valve, dorsal edge	,,	,,

Fig. 13. *Cythereis cornuta.*

a × 50	Adult, right valve, outside	Detritus.	Charing.
b × 50	Young, left valve, outside	,,	,,
c × 50	Young, perfect, dorsal aspect	,,	,,
d × 50	Young, perfect, ventral aspect	,,	,,
e × 50	Young, perfect, anterior aspect	,,	,,

Fig. 14. *Cythereis alata.*

a × 50	Right valve, outside	Chalk.	Norwich.
b × 50	Perfect, dorsal aspect	,,	,,
c × 50	Perfect, ventral aspect	,,	,,
d × 50	Perfect, anterior aspect	,,	,,

Fig. 15. *Bairdia subdeltoidea.*

a × 30	Perfect, dorsal aspect	Detritus.	Charing.
b × 30	Perfect, anterior aspect	,,	,,
c × 30	Left valve, outside	Chalk.	Gravesend.
d × 30	Right valve, outside	,,	,,
e × 30	Left valve, inside	,,	,,
f × 30	Right valve, inside	,,	,,
f′ × 30	Right valve, dorsal edge	,,	,,
f″ × 30	Right valve, anterior edge	,,	,,
f‴ × 30	Right valve, posterior edge	,,	,,

Fig. 16. *Bairdia Siliqua.*

a × 30	Perfect, dorsal aspect	Detritus.	Charing.
b × 30	Perfect, anterior aspect	,,	,,
c × 30	Right valve, outside	Chalk.	Gravesend.
d × 30	Right valve, inside	,,	,,
e × 30	Var. *α*, perfect, anterior aspect	Detritus.	Charing.
f × 30	Var. *α*, perfect, obliquely placed, left valve upwards	,,	,,
g × 30	Var. *α*, perfect, dorsal aspect	,,	,,
h × 30	Var. *β*, perfect, right valve upwards	,,	,,

12. a.

12. b.

12. c.

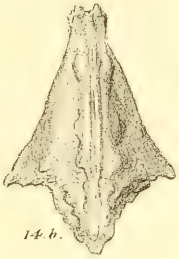
13. a.

13. b.

13. c.

13. d.

14. a.


14. b.

14. c.

14. d.

13. e.

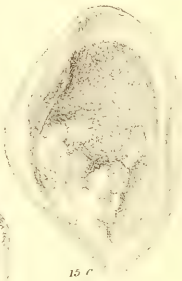
15. a.

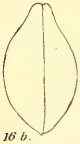
15. b.

15. c.

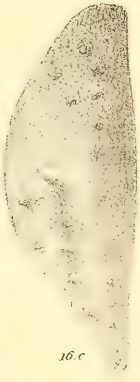
15. d.

15. f.


15. e.


16. b.

16. a.


16. c.

16. d.

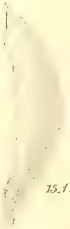
16. e.

15. f'.

a

15. f'''.

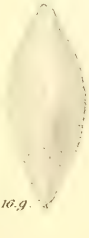
b


15. f.

a

b

16. f.


16. g.

16. h.

TAB. VI.

Fig. 17. *Bairdia Harrisiana.*

a × 50	Perfect, dorsal aspect	Detritus.	Charing.
b × 50	Perfect, anterior aspect	,,	,,
c × 50	Perfect, left valve upwards	,,	,,
d × 50	Right valve, outside	,,	,,
e × 50	Right valve, inside	Chalk.	Charlton.
f × 50	Left valve, inside	,,	,,

Fig. 18. *Bairdia angusta.*

a × 50	Perfect, dorsal aspect	Gault.	Folkstone.
b × 50	Perfect, anterior aspect	,,	,,
c × 50	Perfect, placed obliquely, right valve upwards	Detritus.	Charing.
d × 50	Perfect, left valve upwards	Gault.	Folkstone.
e × 50	Right valve, inside	,,	,,
e' × 50	Right valve, ventral edge	,,	,,
f × 50	Left valve, inside	,,	,,
f'' × 100	Left valve, hinge-margin (of fig. 18 *f*)	,,	,,

Fig. 19. *Bairdia triquetra.*

a × 50	Left valve, outside	Chalk.	Gravesend.
b × 50	Left valve, dorsal edge	,,	,,
c × 50	Left valve, anterior aspect	,,	,,

Fig. 20. *Bairdia Silicula.*

a × 50	Left valve, inside	Detritus.	Charing.
b × 50	Left valve, dorsal edge	,,	,,
c × 50	Left valve, anterior aspect	,,	,,

Fig. 21. *Cytherella* (?) *appendiculata.*

a × 50	Right (?) valve, outside	Gault.	Folkstone.
b × 50	Perfect, dorsal aspect	,,	,,

Fig. 22. *Cytherella* (?) *Mantelliana.*

a × 50	Perfect, left valve upwards	Detritus.	Charing.
b × 50	Perfect, dorsal aspect	,,	,,
c × 50	Perfect, anterior aspect	,,	,,

Fig. 23. *Cytherella* (?) *Bosquetiana.*

a × 50	Perfect, right valve upwards	Detritus.	Charing.
b × 50	Perfect, dorsal aspect	,,	,,
c × 50	Left valve, anterior aspect	,,	,,

17.a

17.b

17.c

17.d

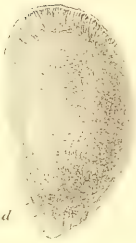
17.e

17.f

18.a

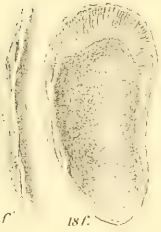
18.b

18.c


18.d

18.e

18.e


18.f

18.f

19.a

19.b

19.c

20.a

20.b

20.c

21.a

21.b

22.a

22.b

22.c

23.a

23.b

TAB. VII.

Fig. 24. *Cytherella ovata.*

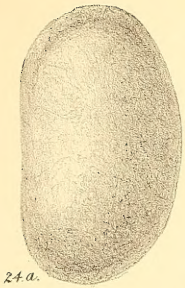
a × 50	Adult, left valve, outside	Chalk.	
b × 50	Adult, right valve, outside	,,	
c × 50	Adult, right valve, inside	,,	
d × 50	Adult, left valve, inside	,,	
d' × 50	Adult, left valve, dorsal edge	,,	
e × 50	Adult, perfect, dorsal aspect	,,	
f × 50	Adult, perfect, anterior aspect, seen obliquely	,,	
g × 50	Adult, perfect, transverse section	,,	
h × 50	Var., right valve, outside	Detritus.	Charing.
i × 50	Young, right valve, outside	Chalk.	

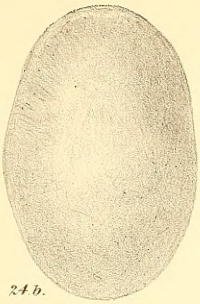
Fig. 25. *Cytherella truncata.*

a × 50	Adult, perfect, dorsal aspect	Detritus.	Charing.
b × 50	Adult, perfect, anterior aspect	,,	,,
c × 50	Adult, perfect, left valve upwards	,,	,,
d × 50	Adult, cast of interior of carapace	Gault.	Leacon Hill.
e × 50	Young, perfect, right valve upwards	Detritus.	Charing.

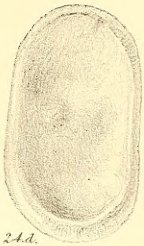
Fig. 26. *Cytherella Williamsoniana.*

a × 50	Adult, perfect, dorsal aspect	Gault.	Folkstone.
b × 50	Immature, perfect, dorsal aspect	,,	,,
c × 50	Adult, perfect, ventral aspect	,,	,,
d × 50	Adult, perfect, anterior aspect	Detritus.	Charing.
e × 50	Immature, left valve, outside	,,	,,
f × 50	Adult, right valve, outside	Chalk.	Gravesend.
g × 50	Adult, right valve, inside	Gault.	Folkstone.
h × 50	Young, right valve, outside	,,	,,
i × 50	Var. *granulosa*, right valve, outside	Chalk.	Norwich.

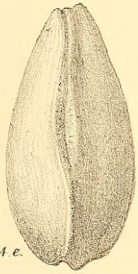

24.a.


24.b.

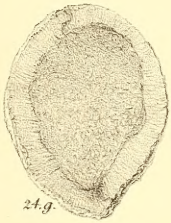
24.c.


24.d.

24.d'.


24.e.

24.f.

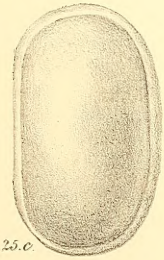

24.g.

24.h.

24.i.

25.a.

25.b.


25.c.

25.d.

25.e

26.i.

26.a.

26.b

26.c.

26.d.

26.e

26.f.

26.g.

26.h.

S.W. Leonard del. et lith.

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